SHOUT
SHARE
IT

S. BM.1015

GENERA
2 9 JAN
LIBRARY
NATURAL HIS

Bulletin of the British Museum (Natural History)

Entomology series Vol 41 1980

British Museum (Natural History)
London 1981

Dates of publication of the parts

No 1	28 August 1980
No 2	25 September 1980
No 3	30 October 1980
No 4	18 December 1980
No 5	18 December 1980

ISSN 0524–6431

Printed in Great Britain by The Whitefriars Press Ltd, London and Tonbridge

BR
GENERAL
2 9 JAN 19
LIBRARY
NATURAL HISTO

Contents

Entomology Volume 41

Page

No 1 A revision of the western Palaearctic species of the genus *Meteorus* (Hymenoptera: Braconidae)
T. Huddleston 1

No 2 A revision of the Old World Polymorphanisini (Trichoptera: Hydropsychidae)
P. C. Barnard 59

No 3 A review of the genera of Neotropical Encyrtidae (Hymenoptera: Chalcidoidea)
John S. Noyes 107

No 4 A revision of the British species of *Dendrocerus* Ratzeburg (Hymenoptera: Ceraphronoidea) with a review of their biology as aphid hyperparasites
N. D. M. Fergusson 255

No 5 A revision of the Pacific species of *Conocephalus* Thunberg (Orthoptera: Tettigoniidae)
Linda M. Pitkin 315

BRITISH MUSEUM
GENERAL
-2 OCT 1980
LIBRARY
NATURAL HISTORY

Bulletin of the
British Museum (Natural History)

A revision of the western Palaearctic species of the genus *Meteorus* (Hymenoptera: Braconidae)

T. Huddleston

Entomology series Vol 41 No 1 28 August 1980

The *Bulletin of the British Museum (Natural History)*, instituted in 1949, is issued in four scientific series, Botany, Entomology, Geology (incorporating Mineralogy) and Zoology, and an Historical series.

Papers in the *Bulletin* are primarily the results of research carried out on the unique and ever-growing collections of the Museum, both by the scientific staff of the Museum and by specialists from elsewhere who make use of the Museum's resources. Many of the papers are works of reference that will remain indispensable for years to come.

Parts are published at irregular intervals as they become ready, each is complete in itself, available separately, and individually priced. Volumes contain about 300 pages and are not necessarily completed within one calendar year. Subscriptions may be placed for one or more series. Subscriptions vary according to the contents of the Volume and are based on a forecast list of titles. As each volume nears completion, subscribers are informed of the cost of the next Volume and invited to renew their subscriptions. Orders and enquiries should be sent to:

Publications Sales,
British Museum (Natural History),
Cromwell Road,
London SW7 5BD,
England.

World List abbreviation: *Bull. Br. Mus. nat. Hist.* (Ent.)

© Trustees of the British Museum (Natural History), 1980

ISSN 0524-6431

Entomology series
Vol 41 No 1 pp 1–58

British Museum (Natural History)
Cromwell Road
London SW7 5BD

Issued 28 August 1980

BRITISH MUSEUM (NATURAL HISTORY)
GENERAL
- 2 OCT 1980
LIBRARY

A revision of the western Palaearctic species of the genus *Meteorus* (Hymenoptera: Braconidae)

T. Huddleston K
Department of Entomology, British Museum (Natural History), Cromwell Road, London SW7 5BD

Contents

Synopsis . . . 1
Introduction . . . 1
Depositories . . . 2
Taxonomic history . . . 2
Taxonomic characters . . . 4
Biology . . . 6
List of host records . . . 7
Meteorus Haliday . . . 9
  Synonymic list of species . . . 10
  Key to species (females) . . . 11
  Descriptions of species . . . 20
  Nomina dubia . . . 54
Acknowledgements . . . 55
References . . . 55
Index . . . 57

Synopsis

The species of the genus *Meteorus* from the western Palaearctic zoogeographical region are revised, keyed and illustrated. Thirty-six of the 121 nominal species discussed are considered to be valid and 3 are new. Seventy-one names are placed in synonymy, 44 for the first time. Seventy-seven primary types have been examined and of these 35 lectotypes are herein designated. Fourteen species are considered nomina dubia. About 3500 specimens have been examined.

Introduction

The taxonomy of the parasitic Hymenoptera is the least known of any large group of insects and, until recent years, the Braconidae have received even less attention than most other groups of Parasitica. There is therefore a pressing need for revisionary work in most parts of the family. Moreover this is no mere academic exercise; many species of Braconidae use as hosts insects which are important economically as pests of crops. The need for programmed 'biological' control is already becoming more urgent as the effectiveness of chemical methods of pest control declines. The use of parasitoid insects in the control of pest species has so far met with only sporadic success. For biological control to be effective an intimate knowledge of the biology of the insects involved is essential and this in turn is founded upon an accurate knowledge of their taxonomy. This paper is concerned with the taxonomy of the western Palaearctic species of *Meteorus,* all of which appear to be primary parasites of the larvae of either Lepidoptera or Coleoptera.

It was originally intended to include in this revision the species of the whole of the Palaearctic region. No material was available for study from the U.S.S.R. or from China, however, nor was type-material available of the species described from the U.S.S.R. (*M. baicalensis* Telenga, *M. flagellatus* Alexeev, *M. politutele* Shenefelt [replacement name for *politus* Telenga, not Provancher], *M. pospelowi* Telenga). These areas have therefore been omitted from consideration.

Bull. Br. Mus. nat. Hist. (Ent.) **41** (1): 1–58 Issued 28 August, 1980

All other areas of the Palaearctic region have been included but the bulk of the material available for study came from NW. Europe.

Depositories

MNHU, Berlin	Museum für Naturkunde der Humboldt-Universität, Berlin.
NMB, Berne	Naturhistorisches Museum Bern, Berne.
IRSNB, Brussels	Institut Royal des Sciences Naturelles de Belgique, Brussels.
HNHM, Budapest	Hungarian Natural History Museum, Budapest.
NMI, Dublin	National Museum of Ireland, Dublin.
IP, Eberswalde	Institut für Pflanzenschutzforschung, Eberswalde.
RNH, Leiden	Rijksmuseum van Natuurlijke Historie, Leiden.
BMNH	British Museum (Natural History), London.
ZI, Lund	Zoologiska Institution, Lund.
NMV, Melbourne	National Museum of Victoria, Melbourne.
ZSBS, Munich	Zoologische Sammlung des Bayerischen Staates, Munich.
EH, Munich	E. Haeselbarth collection, Munich.
MZ, Naples	Museo Zoologia, Naples.
CNC, Ottawa	Canadian National Collection, Biosystematics Research Institute, Ottawa.
UM, Oxford	University Museum, Oxford.
MNHN, Paris	Muséum National d'Histoire Naturelle, Paris.
ZC, Plovdiv	A. Zaykov collection, Plovdiv.
MSC, Reading	M.R. Shaw collection, Reading.
USDA, Sèvres	USDA, European Parasite Laboratory, Sèvres.
NR, Stockholm	Naturhistoriska Riksmuseet, Stockholm.
HC, Stockholm	K.-J. Hedqvist collection, Stockholm.
MZS, Turin	Museo ed Istituto di Zoologia Sistematica, Università di Torino, Turin.
UDE, Uppsala	University Department of Entomology, Uppsala.
NM, Vienna	Naturhistorisches Museum, Vienna.
IFF, Vienna	Institut für Forstentomologie und Forstschutz, Vienna.
AU, Wageningen	Agricultural University, Wageningen.
USNM, Washington	[U.S. National Museum] National Museum of Natural History, Washington, D.C.
NIAS, Yatabe	Plant Disease Herbarium and Insect Museum, National Institute of Agricultural Sciences, Yatabe.

Taxonomic history

Meteorus Haliday (1835: 24) was first used as a subgenus of *Perilitus* Nees von Esenbeck, as it was then defined, to accommodate those species having three submarginal (cubital) cells in the forewing. Haliday dealt with 17 species of *Meteorus* of which only the 13 comprising his 'section B' are now considered to belong in *Meteorus* s.str.; the remainder are placed in the genus *Zele* Curtis [*Zemiotes* Foerster]. In section B, Haliday described seven species as new to science. Haliday's collection is now housed in the NMI, Dublin where A. W. Stelfox in 1948 collated the *Meteorus* and transferred them to their present cabinet from the boxes in which Haliday had left them. Stelfox, in his unpublished notes on the collection, stated 'no specimen bears the name of one of his [Haliday's] own species, though several carry his Ms labels with Wesmael's names; also two have his Ms labels bearing "nomina nuda" or possibly "pet names" which are nowhere referred to in his Ms lists. He has therefore left us no "types"!'. Furthermore, the four species which were least adequately described (*delator, jaculator, profligator* and *vexator*) are no longer present in the collection; the interpretation of these species must therefore rest entirely upon their descriptions.

Nees von Esenbeck (1811) described five species of 'Bracon' which he later transferred to section II of his genus *Perilitus* (corresponding to *Meteorus* s.l.), adding descriptions of four more species. Nees' collection was destroyed during the 1939–45 war (Griffiths, 1964: 829) and there is therefore no original material of his species. In most cases, however, there are long-established and generally accepted usages of Nees' names and the identification of his species causes but little difficulty. It has not therefore been considered necessary to designate neotypes.

Wesmael (1835) described 16 species of *Meteorus* in the genus *Perilitus*. Wesmael's collection is well-preserved in Brussels and the identity of the species he described can therefore be established beyond doubt. Some slight difficulty arises in distinguishing valid syntype specimens from amongst Wesmael's material because the number of specimens labelled by Wesmael as belonging to a particular species is generally more than the number of specimens of that species which he recorded as being in his possession at the time of the description. Wesmael stated, for instance, that he possessed one female of *affinis* but three specimens in the collection are so labelled by him. Again, a specimen (*abdominator*) labelled *fragilis* in Wesmael's handwriting has a second label bearing the date 1838 and could not therefore have been part of the original material of *fragilis*. The determination label is indistinguishable, however, from those on the rest of the series labelled *fragilis* which includes other misidentified specimens. I suspect therefore that Wesmael labelled his collection long after the publication of the descriptions of his species, probably after 1838, and that he included subsequently captured material which he had not examined with the meticulous care displayed in his original publication. I do not consider it at all likely that Wesmael had before him mixed series when preparing his descriptions because these are far too precise to have been based on badly sorted material.

Ratzeburg (1844; 1848; 1852) described (in the genus *Perilitus*) nine new species of *Meteorus*. Ratzeburg's descriptions are deficient even by the standards of his contemporaries and so some of his species are impossible to interpret without types. Ratzeburg's collection was largely destroyed during the 1939–45 war and Königsmann (1964) has shown that the remnant of the collection which survives contains specimens which can be accepted as type-material of only two of the species of *Meteorus* which Ratzeburg described.

Ruthe (1862) described 20 new species of *Meteorus* in a posthumous paper which was usefully annotated by Reinhard. I have been able to examine all of Ruthe's original material most of which is housed in the BMNH. Ruthe placed too much emphasis on minor differences in colour and consequently only one of his species remains valid.

Marshall (1887; 1891; 1898; 1899) gave a comprehensive interpretation of the work of Haliday and Wesmael and to a lesser extent of other continental workers. He deprived himself, however, of the use of many valuable characters by his method of mounting his specimens face down on squares of card. Marshall described two species of *Meteorus* as new, only one of which is presently considered valid, and brought forward a description of a third (Capron *in* Marshall, 1887).

Thomson (1895), in typically idiosyncratic fashion, put forward 10 new names in *Meteorus* of which five were re-interpretations of names used by Haliday or by Ruthe and five proposed as undoubtedly new to science. Despite his procedural eccentricities Thomson's work was superior to that of his predecessors (save only Wesmael) and, indeed, to that of most of his successors. Thomson's collection is well preserved in Lund and I have had the opportunity of examining the material. Four of Thomson's species remain valid. The presence on a pin of a species label in Thomson's handwriting should not be taken as indicating that that specimen was so labelled by Thomson. Labels which were Thomson's drawer labels were transferred to the specimen which stood first in the series above the label when the collection was moved from Thomson's cabinets into more modern cabinets (R. Danielsson, pers. comm.).

Schmiedeknecht (1897) published a key to the European species of *Meteorus* incorporating descriptions of three new species. Schmiedeknecht appears to have based his work almost entirely upon earlier descriptions and this several times led him into misinterpretation. One of his species remains valid.

Morley (1908) reiterated much of Marshall's work on the British species of the genus; his contribution to the subject was insignificant.

Lyle (1914) published some useful data on the biology of some species of *Meteorus;* this work needs to be carefully interpreted because Lyle's identification of the parasite species was sometimes inaccurate. I have been able to examine Lyle's collection, now housed in the BMNH, but his material is deprived of much of its value by Lyle's method of mounting insects on large squares of thick card. Lyle described one species which I have placed in synonymy in this paper.

Muesebeck (1923) monographed the Nearctic species of *Meteorus* s.l. and emphasized the value of several important characters which had not been fully exploited in previous work on the genus.

Muesebeck (1939; 1954) described two Palaearctic species of *Meteorus*, one of which is now considered valid.

Fischer (1956–70) has contributed much to the literature on the genus and though he has misinterpreted some of the older species he has established some useful synonymy and has designated a neotype for *M. vexator*.

Tobias (1976) has keyed the species of *Meteorus* which are represented in the fauna of the Caucasus.

Nineteenth-century hymenopterists were handicapped in their understanding of the limits of species by their practice of working with relatively few specimens of each species. Many so-called species were founded upon one or two specimens which differed but little from already-described taxa. Then too, the reliance on colour differences to distinguish species has been a fertile source of misinterpretation; colour in *Meteorus* is the least stable characteristic and in no case is colour alone sufficient to distinguish species in the absence of more stable morphological differences. There have been only two keys to major parts of the Palaearctic *Meteorus* fauna (Marshall, 1891; Schmiedeknecht, 1897). Both of these works contained a plethora of putative species because of the authors' acceptance of differences in colour as indicating different species. Also both largely derived their concepts of species from published descriptions which were often imprecise or misleading. I have based my interpretation of the species upon the original material wherever possible together with much other material of the species involved and I have arrived at my concept of these species in the light of the characters discussed below.

Taxonomic characters

The antennal segments vary slightly within a species in number, shape and relative length, but nevertheless provide characteristics of considerable usefulness if the possibilities of variation are borne in mind. The antennae exhibit marked sexual dimorphism in most species; within a given species those of the female are almost always shorter than those of the male, not only because they have fewer segments on average but also because the segments are themselves shorter.

The shape of the head is generally extremely stable within a species. The shape of the temples as seen from above, the lateral profile of the face, the frons and the vertex and the shape in face view of the vertex, genae and clypeus often furnish diagnostic characters of great value. The length of the malar space and the breadth of the face in relation to its height are also of considerable significance; both are related largely to the size and disposition of the eyes.

The degree of convergence of the eyes is an extremely useful character for the differentiation of species in *Meteorus*. Its full significance does not appear to have been noticed by previous workers. When the distance between the tops of the eyes (at their point of intersection with the apparent 'edge' of the head) is twice or more the breadth of the face (the minimum distance between the eyes) I have called the eyes 'strongly convergent' (Fig. 4), otherwise 'not strongly convergent'. More subtle differences in convergence will only be appreciated with the aid of the various figures. For the proper appreciation of this character the head must be examined directly from in front so that the bases of the hind ocelli are upon the 'horizon'. This character is subject to only minor variation in most species though there is considerable sexual dimorphism, the eyes of the male usually being much less convergent than those of the female. The size of the eyes is also often of considerable importance in distinguishing species, particularly their length in dorsal view in relation to the length of the temple.

The size of the ocelli varies slightly within a species but is nonetheless of considerable importance at species-group level. Closely related species generally have ocelli of approximately the same size so that this character is of limited use at species level. The comparative size of the ocelli is expressed as the greatest diameter of a hind ocellus compared with its least distance from the border of the nearest eye. In the text this is expressed in the form OO (ocellar-ocular distance) = OD (ocellar diameter). I have used the term 'small ocelli' where the ocellar-ocular distance is at least 2·5 times ocellar diameters, and the term 'large ocelli' where the ocellar-ocular distance is at most 2·0 times ocellar diameters.

The amount of twist of the mandibles and their size is constant within a species. The mandibles of different species, however, show considerable differences which are related to other characteristics of the ocelli, the tarsal claws and the head shape as expressed in couplet one of the key to species. The mandibles of some species are small, delicate and strongly twisted so that the lower tooth is behind the upper when viewed from in front, i.e. at right angles to the base of the mandible (Fig. 38). Mandibles of this type tend to be constricted in the middle. Other species have mandibles which are not twisted (i.e. the teeth are in the same plane as the base of the mandible) and these are long and broad and not markedly constricted in the middle (Figs 12, 29). Species do occur in which the mandibles are intermediate in type between these two extremes but nonetheless the mandibular characteristics are most useful in the differentiation of species and do not appear to have been fully exploited by previous workers.

The presence or absence of paired pits in the dorsal surface of tergite one is a useful character for the separation of groups of species in *Meteorus*. Some care is needed for the correct evaluation of this character; in several species without pits there are in some specimens convolutions of the sculpture on the dorsal surface of tergite one which give the appearance of pits at first glance. Where pits are present they are distinct even if small and the ventral borders of the tergite are never joined beneath. In nearly all species which do not have pits in the dorsal surface of tergite one the ventral borders of the tergite are in contact to a greater or lesser extent. Muesebeck (1923) brought to notice the fundamental importance of the degree of contiguity of the ventral borders of tergite one as a character for the separation of species in *Meteorus*. Nixon (1941) made use of this character in his review of the African species of *Meteorus* but it has been largely ignored in more recent work on the genus. There is little or no variation in this structure at the infraspecific level in those species lacking pits and it is therefore a stable and most useful character. *M. pulchricornis*, as I have defined that species, is exceptional in that most specimens have no dorsal pits in tergite one and the ventral borders of the tergite are joined while a few specimens do have true pits and, in these, the ventral borders of the tergite are narrowly separated. Some care is required in tracing the borders of tergite one; their course is not always easy to discern because the lateral faces of the tergite often bear longitudinal striations which can be mistaken for the edge of the tergite. Then too, the sternite at the base of segment one of the gaster is sometimes heavily chitinized and sculptured and this can be confused with the ventral part of the tergite on a superficial examination.

Ovipositor length varies within a species but the range of variation is well defined and fairly small and ovipositor length is therefore a useful character for the differentiation of species in *Meteorus*. Previous workers have generally expressed ovipositor length in relation to the length of the gaster. This is not entirely satisfactory because the gaster is a telescopic structure which can therefore vary in length appreciably within a species. I have expressed ovipositor length as a multiple of the length of tergite one of the gaster. The ovipositor is measured from the base to the tip and not merely the portion of it which, in dorsal view, can be seen projecting beyond the end of the gaster – the exserted part. In many specimens the ovipositor base is concealed by the overlapping terminal tergites of the gaster and so I have taken the apex of the hypopygium as providing the most reliable indication of the position of the ovipositor base. Apart from the differences in length between species the ovipositor shows few structural features which can be used in the differentiation of species and the hypopygium none.

The presence or absence of lobes on the tarsal claws is a useful character for the separation of groups of species in *Meteorus* (Figs 34, 35, 58). This character does not appear to have been noticed by previous workers. There is little variation in claw shape within a species but differences in claw shape between closely related species though often significant are generally rather too subtle to be of use in a key. When examining tarsal claws care must be taken that they are seen in full lateral view, the presence of even a large lobe may otherwise be overlooked.

The venation in *Meteorus* is extremely labile and therefore furnishes far fewer diagnostic features than has often been supposed.

In general the sculptural characteristics of *Meteorus* exhibit a rather wide degree of infraspecific variation. In most species, however, the sculpture of the propodeum and of the sternaulus seem to be rather more stable than that elsewhere and can be of considerable help in distinguishing species. The sculpture of the hind coxa is also often of considerable value in diagnosis of species; in those species with strongly rugose hind coxae it is rare to find specimens in which the hind coxae are smooth and in those which typically have a smooth, punctate hind coxa it is unusual to find individuals whose coxae bear rugosity and very rarely is this strongly developed. Even where the sculpture varies there tends to be a characteristic pattern of sculptural elements which can often aid in forming a 'picture' of a species. Tergite one, for instance, tends to have a characteristic pattern in each species though specimens occur more or less frequently in which the usually predominant sculptural element is superseded by that which is normally subsidiary.

Size differences in *Meteorus* are often of little taxonomic significance. The size of a parasitoid insect is governed to a certain extent by the size of the host in which it develops. Insects belonging to a species which uses a variety of hosts therefore often differ considerably in their body size. A host species which itself exhibits considerable size differences affects its parasites in the same way.

The morphological terms used in this paper are defined in Richards (1977).

Biology

In general little detailed work has been done on the biology of *Meteorus* and, naturally, most of the attention which has been given to the subject has been focused on the species of potential usefulness in biological control programmes. Tobias (1976) and Marsh (1979) cite the relevant literature. The work of Madel (1963) on the morphology and biology of *colon* (as *fragilis*) is an exceptionally scholarly piece of work and should serve as a model for such studies. Achtelig (1974) gives a fine study of the male genital anatomy in *oculatus* (as *pachypus*).

Most species of *Meteorus* are solitary parasites but *M. rubens* and *M. heliophilus* are gregarious (Marshall, 1887; Lyle, 1914; Tobias, 1976). The mature larvae of some species spin a cocoon suspended by a thread and it is from this habit that the name of the genus is derived. Among the exceptions to this are the gregarious species, which spin their cocoons together in loose heaps, and several species which parasitize wood-boring beetles and which, as far as is known, form stalkless cocoons within the beetles' burrows (Mason, 1973). Lyle (1914) suggested that species of *Meteorus* overwinter as eggs or as immature larvae within the body of the host or as mature larvae within the cocoon; on the evidence so far the last alternative seems the least likely. Rearing data suggest that at least some species of *Meteorus* overwinter in different host species from those which they use in their summer generations. There is no evidence that any species of the genus overwinters as an adult though the possibility remains. Some species of *Meteorus* attack Coleoptera whilst others attack Lepidoptera; there is no evidence that any species of the genus utilizes both groups as hosts. In general, the species which parasitize Coleoptera are those with small eyes and ocelli, simple tarsal claws and stout mandibles though two species, *cespitator* and *micropterus,* have these characteristics but are parasitic on larvae of Lepidoptera. The Coleoptera from which *Meteorus* have been recorded are all species in which the larvae live in concealment, boring in wood, in bark or in fungus. The relatively small eyes and ocelli of these parasites is presumably a reflection of their use of concealed hosts and the consequent necessity for them to rely on non-visual means of detection. *M. cespitator* and *micropterus* have been recorded from hosts the larvae of which are often at least partially concealed. The species of *Meteorus* which parasitize Lepidoptera generally have large eyes and ocelli, lobed tarsal claws and slender, strongly twisted mandibles. *M. consimilis* has some of these characteristics, however, and has been recorded (in the literature) only from *Scolytus multistriatus* (Marsham). The majority of the Lepidoptera from which *Meteorus* species have been recorded are those with larvae which do not live in concealment though tortricid larvae are generally partly concealed and most noctuid larvae expose themselves only after dark. The larvae of some species of Lepidoptera rely on camouflage for their protection, those of *Thera variata* (Denis & Schiffermüller), for instance, are exceptionally well camouflaged and only *Meteorus lionotus,* which has exceptionally large eyes and ocelli, has been recorded as parasitizing them. The species of *Meteorus* which parasitize Lepidoptera therefore have large eyes and ocelli, presumably because they are able to use sight in locating their hosts.

M. micropterus, consimilis and *abdominator* are similar in appearance; they are dark, heavily sculptured insects with short, dark wings and short, thick legs and antennae. The morphological similarities of these species probably indicate that they have a common mode of host-searching rather than indicating any close phylogenetic affinity. *M. micropterus* has been recorded from Lepidoptera the larvae of which live at the base of dense herbage such as grass tussocks; it probably hunts on foot and its stout build will enable it the better to push its way into suitable host-habitats. No doubt *consimilis* also reaches its host by pushing through crevices in bark.

M. corax, sulcatus and *nixoni* form a distinctive group of species of which *corax* and *sulcatus* are known to parasitize the larvae of cerambycids. The three species have in common a stout basal abdominal segment and a long ovipositor; this is presumably because they need to oviposit through wood.

M. affinis has been recorded from hosts belonging to families of Lepidoptera which are not closely related taxonomically. The larvae of both host-species, however, have a similar mode of life feeding at the base of moss on walls or on tree-stumps.

I have examined specimens of *ictericus* and *obsoletus* bred only from tortricids. Both species are rather small and slender and have long ovipositors the better to reach their host larvae which are typically loosely concealed in rolled leaves, catkins, buds and so on. There is a single record of *ictericus* (as *lophyriphagus*) having been bred from a sawfly. I believe this to have been a fortuitous occurrence because of the abnormal abundance of the larvae of that sawfly at that particular time, or an erroneous host-identification.

In the literature on *Meteorus* there are many records of host-parasite relationships. Much of this information is of doubtful value because of the uncertainty about the accuracy of the identification of the parasites owing to the lack of reliable keys for their determination. With few exceptions I have cited host data only from the specimens I have examined. In order to confirm all records in the literature it would be necessary to redetermine the material on which those records were based, a quite impracticable task. As far as possible I have put into their present combinations the host names which I have cited. This information is summarized in the following list.

List of host records

Hosts	Species of *Meteorus*
COLEOPTERA	
BIPHYLLIDAE	
Biphyllus lunatus (Fabricius)	*vexator*
SCOLYTIDAE	
Scolytus multistriatus (Marsham)	*consimilis*
? *Scolytus triarmatus* Eggers	*obfuscatus*
CERAMBYCIDAE	
Monochamus saltuarius Gebler	*corax*
Monochamus sartor (Fabricius)	*corax*
Semanotus undatus (L.)	*sulcatus*
Molorchus umbellatarum (von Schreber)	*sulcatus*
MELANDRYIDAE	
Orchesia micans (Panzer)	*longicaudis, obfuscatus*
TENEBRIONIDAE	
Eledenoprius armatus Panzer	*longicaudis*
Corticeus longulus (Gyllenhal)	*punctifrons*
CISIDAE	
Cis boleti (Scopoli)	*profligator*
LEPIDOPTERA	
HEPIALIDAE	
Hepialus humuli (L.)	*micropterus*
Hepialus fusconebulosa (De Geer)	*micropterus*
ZYGAENIDAE	
Zygaena filipendulae (L.)	*unicolor*

HOSTS	SPECIES OF *Meteorus*
TINEIDAE	
Infurcitinea argentimaculella (Stainton)	*affinis*
Nemapogon granella (L.)	*cespitator*
? *Monopis rusticella* (Hübner)	*cespitator*
Trichophaga tapetzella (L.)	*cespitator*
GELECHIIDAE	
Pectinophora gossypiella (Saunders)	*graciliventris*
TORTRICIDAE	
Archips podana (Scopoli)	*ictericus*
Epiphyas postvittana (Walker)	*ictericus*
Adoxophyes orana (Fischer von Röslerstamm)	*ictericus*
Tortrix viridana (L.)	*ictericus, obsoletus*
Croesia bergmanniana (L.)	*ictericus*
Acleris hastiana (L.)	*ictericus*
Epinotia sordidana (Hübner)	*ictericus*
Gypsonoma dealbana (Frölich)	*obsoletus*
PYRALIDAE	
Scoparia sp.	*affinis*
Ephestia cautella (Walker)	*graciliventris*
LYCAENIDAE	
Thecla betulae (L.)	*pulchricornis*
NYMPHALIDAE	
Ladoga camilla (L.)	*colon*
Cynthia cardui (L.)	*rubens*
Charaxes jasius jasius (L.)	*pulchricornis*
SATYRIDAE	
Maniola jurtina (L.)	*versicolor*
LASIOCAMPIDAE	
Poecilocampa populi (L.)	*pulchricornis*
Malacosoma neustria (L.)	*versicolor*
Lasiocampa quercus (L.)	*versicolor*
Macrothylacia rubi (L.)	*versicolor*
Dendrolimus pini (L.)	*versicolor*
GEOMETRIDAE	
Idaea muricata (Hufnagel)	*rubens*
Eulithis testata (L.)	*versicolor*
Thera obeliscata (Hübner)	*lionotus*
Thera variata (Denis & Schiffermüller)	*lionotus*
Thera juniperata (L.)	*lionotus*
Operophtera brumata (L.)	*pulchricornis*
Eupithecia nanata (Hübner)	*pulchricornis*
Anticollix sparsata (L.)	*colon*
Apeira syringaria (L.)	*melanostictus*
Ennomos quercinaria (Hufnagel)	*melanostictus*
Agriopis leucophaearia (Denis & Schiffermüller)	*pulchricornis*
Agriopis aurantiaria (Hübner)	*pulchricornis*
THAUMETOPOEIDAE	
Thaumetopoeia processionea (L.)	*versicolor*
LYMANTRIIDAE	
Dasychira pudibunda (L.)	*versicolor*
Euproctis chrysorrhoea (L.)	*versicolor*
Leucoma salicis (L.)	*versicolor*
Lymantria dispar (L.)	*pulchricornis*
ARCTIIDAE	
Setina irrorella (L.)	*abscissus*
NOLIDAE	
Nola cuculatella (L.)	*colon, pulchricornis*

Hosts	Species of *Meteorus*
NOCTUIDAE	
Agrotis exclamationis (L.)	*rubens*
Agrotis ipsilon (Hufnagel)	*rubens*
Noctua pronuba (L.)	*rubens*
Noctua fimbriata (Schreber)	*heliophilus*
Lycophotia porphyrea (Denis & Schiffermüller)	*gyrator, pulchricornis, versicolor*
Diarsia brunnea (Denis & Schiffermüller)	*gyrator*
Xestia triangulum (Hufnagel)	*heliophilus*
Xestia xanthographa (Denis & Schiffermüller)	*gyrator*
Anarta myrtilli (L.)	*versicolor*
Polia nebulosa (Hufnagel)	*heliophilus*
Mamestra brassicae (L.)	*rubens*
Lacanobia oleracea (L.)	*gyrator*
Orthosia stabilis (Denis & Schiffermüller)	*heliophilus*
Mythimna sp.	*gyrator*
Cleoceris viminalis (Fabricius)	*gyrator*
Lithophane ornitopus (Hufnagel)	*heliophilus*
Eupsilia transversa (Hufnagel)	*pulchricornis*
Agrochola lota (Clerck)	*gyrator*
Thalpophila matura (Hufnagel)	*gyrator*
Euplexia lucipara (L.)	*gyrator*
Ipimorpha retusa (L.)	*gyrator*
Cosmia trapezina (L.)	*gyrator*
Spodoptera exigua (Hübner)	*rubens*
Bena prasinana (L.)	*colon*
HYMENOPTERA	
DIPRIONIDAE	
Neodiprion sertifer (Geoffroy in Fourcroy)	*ictericus*

METEORUS Haliday

Meteorus Haliday, 1835: 24. Type-species: *Meteorus pendulator* (Latreille), by subsequent designation (Haliday *in* Westwood, 1839: 61, Synopsis).

Saprotichus Holmgren, 1868: 430. Type-species: *Saprotichus chinensis* Holmgren, by subsequent designation (Viereck, 1914: 130).

DIAGNOSIS. *Meteorus* is a Euphorine (as defined, for instance, by van Achterberg, 1974) which can be differentiated by the following combination of characters.

Notaulices always present, generally distinct; first segment of gaster narrow at base and broadened apically, never cylindrical, the spiracles at midpoint of segment or slightly behind, occasionally in front but never at base; hair rows on tergites restricted to a single subapical row; ovipositor always exserted; forewing with three submarginal cells, the second generally higher than long (Fig. 13), generally quadrangular, often slightly narrowed anteriorly and rarely triangular, never petiolate; radial cell of hindwing narrowed to apex or parallel-sided never apically broadened or divided.

Meteorus has been recorded from all zoogeographical regions.

Meteorus was placed in a subfamily, Meteorinae, distinct from though related to the Euphorinae until Muesebeck (1923: 4) pointed out the artificial nature of this division and (1935: 5) placed *Meteorus* within the Euphorinae. This placement of the genus has been generally accepted by workers on Braconidae and no modern authority on the group retains *Meteorus* as distinct at more than tribal level. Support for this placement of the genus has come from the work of Capek (1970) on larval morphology and biology, and from that of van Achterberg (1974; 1979) and Tobias (1966; 1976) on adult morphology.

Mason (1973) lifted from synonymy the genus *Zemiotes*, previously regarded as a part of *Meteorus*, and postulated a relationship between *Zemiotes* and *Zele*. I have accepted Mason's division of *Meteorus* s.l. into two genera but have followed van Achterberg's (1979) placement of the two genera together in the Meteorini. Further, van Achterberg (1979) has shown that the name *Zele* is properly applied to the species hitherto placed in *Zemiotes*. He has lifted from synonymy the name *Homolobus* Foerster to accommodate the species traditionally placed in *Zele*. The two genera in the Meteorini may be distinguished as follows.

Radial cell of hindwing narrowed to apex or parallel-sided, never divided, the radial vein not angled; hairs on tergites restricted to single apical rows; tarsal claws sometimes without a basal lobe; tergite one sometimes without dorsal pits . . . . *METEORUS* Haliday

Radial cell of hindwing widened to apex, sometimes divided, radial vein always angled; hairs on tergites not in single rows, covering at least apical half of tergite; tarsal claws always strongly bent and with large basal lobe; tergite one always with dorsal pits . . . . *ZELE* Curtis

Synonymic list of species

abdominator (Nees)
  brunnipes Ruthe **syn. n.**
  brevipesalis Shenefelt **syn. n.**
abscissus Thomson
affinis (Wesmael)
  punctiventris Ruthe **syn. n.**
  ruthei Schmiedeknecht **syn. n.**
  voloscensis Fischer **syn. n.**
brevicauda Thomson
  thuringiacus Schmiedeknecht **syn. n.**
  mongolicus Fahringer **syn. n.**
cespitator (Thunberg)
  atrator (Curtis)
  similator (Nees)
  ambiguus Ruthe **syn. n.**
cinctellus (Spinola)
  fuscipes (Wesmael) **syn. n.**
  tenellus Marshall **syn. n.**
colon (Haliday)
  fragilis (Wesmael) **syn. n.**
  fasciatus (Ratzeburg)
  luridus Ruthe **syn. n.**
consimilis (Nees)
  brevipes (Wesmael)
  albicornis Ruthe
corax Marshall
  monochami Fischer
***eadyi* sp. n.**
filator Haliday
  laticeps (Wesmael) **syn. n.**
  hodisensis Fischer **syn. n.**
graciliventris Muesebeck
gyrator (Thunberg)
  scutellator (Nees)
  parvulus Thomson **syn. n.**
heliophilus Fischer
***hirsutipes* sp. n.**
ictericus (Nees)
  minutus (Thunberg)
  ephippium (Curtis)
  xanthomelus (Wesmael)
  confinis Ruthe **syn. n.**
  fallax Ruthe **syn. n.**
  pleuralis Ruthe **syn. n.**
  liquis Ruthe **syn. n.**
  consors Ruthe
  crassicrus Thomson **syn. n.**
  lophyriphagus Fahringer **syn. n.**
  adoxophyesi Minamikawa **syn. n.**
jaculator (Haliday)
  obscurellus Ruthe
  tenuicornis Thomson **syn. n.**
lionotus Thomson
  ruficoloratus Fischer **syn. n.**
longicaudis (Ratzeburg)
melanostictus Capron
  niger Lyle **syn. n.**
micropterus (Haliday)
***nixoni* sp. n.**
obfuscatus (Nees)
  thoracicus (Curtis)
  formosus (Wesmael)
  fodori Papp **syn. n.**
obsoletus (Wesmael)
  viridanae Johansson **syn. n.**
oculatus Ruthe
  pachypus Schmiedeknecht **syn. n.**
pallipes (Wesmael)
  nigritarsus Ruthe **syn. n.**
profligator (Haliday)
pulchricornis (Wesmael)
  striatus Thomson **syn. n.**
  thomsoni Marshall
  japonicus Ashmead
  nipponensis Viereck
  macedonicus Fischer **syn. n.**
  graeffei Fischer
  tuberculifer Fischer **syn. n.**
punctifrons Thomson
rubens (Nees)
  leviventris (Wesmael)
  islandicus Ruthe
  medianus Ruthe
  scutatus Costa **syn. n.**
  heteroneurus Thomson
  szechuanensis Fahringer **syn. n.**
  mesopotamicus Fischer **syn. n.**

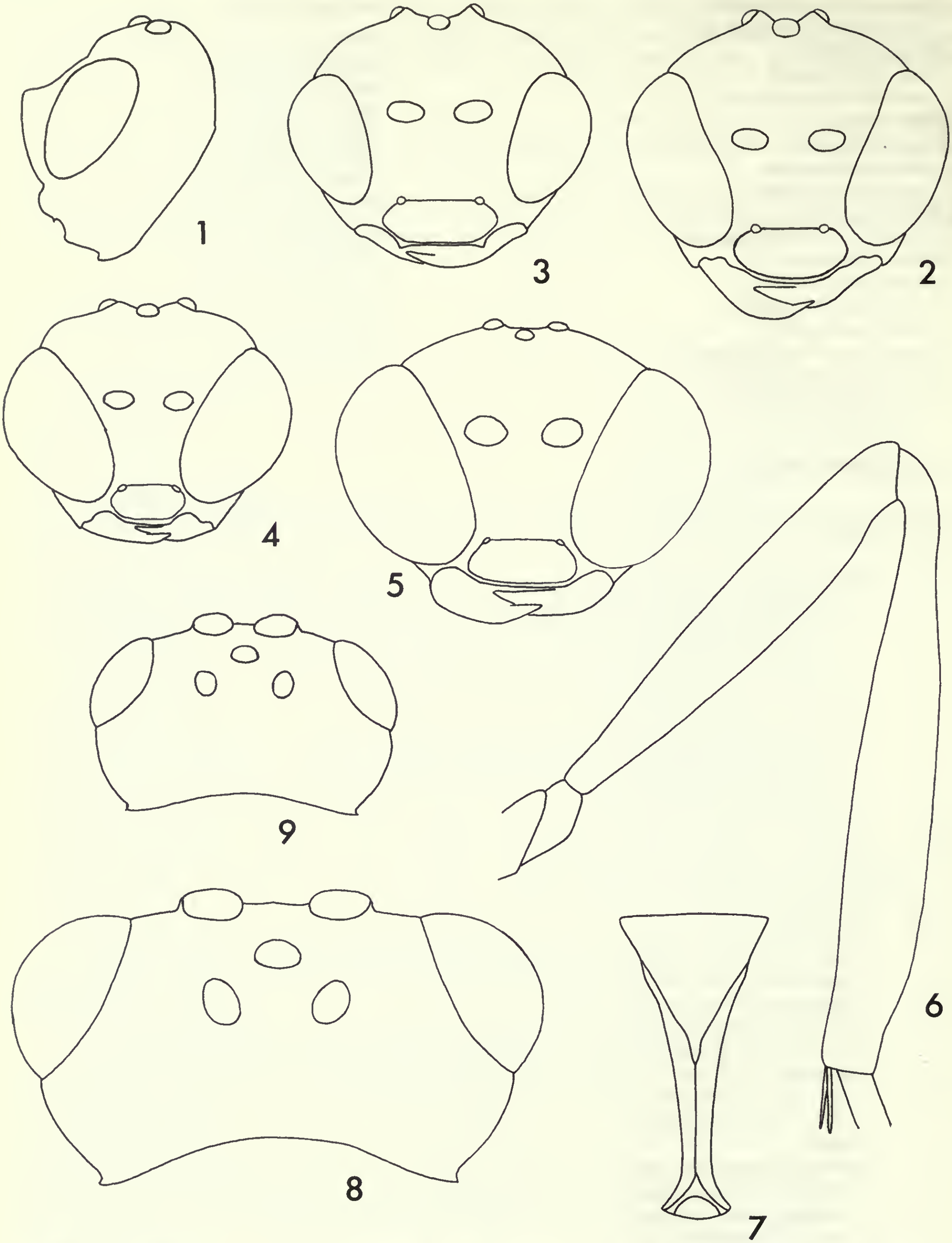
salicorniae Schmiedeknecht
  ocellatus Watanabe **syn. n.**
sulcatus Szépligeti
  insignis Muesebeck
  molorchi Fischer **syn. n.**
tabidus (Wesmael)
  fascialis Ruthe
  dubius Ruthe **syn. n.**
  pentheri Fischer **syn. n.**
unicolor (Wesmael)
  chinensis (Holmgren) **syn. n.**
versicolor (Wesmael)
  bimaculatus (Wesmael)
  brevicornis (Ratzeburg)
  decoloratus Ruthe
  camptolomae Watanabe **syn. n.**
  ikonomovi Fischer **syn. n.**
  hartigi Shenefelt **syn. n.**
vexator (Haliday)

NOMINA DUBIA
dejeanus (Rondani)
delator (Haliday)
dilutor (Ratzeburg)
effeminatus Ruthe
flaviceps (Ratzeburg)
gracilis (Ratzeburg)
longicornis (Ratzeburg)
pallidus (Nees)
pendulator (Latreille)
rubriceps (Ratzeburg)
ruficeps (Nees)
rufus (De Geer)
stenostigma Thomson
wesmaeli (Boie)

Key to species (females)

I am unable to give a key to males. In *Meteorus*, as in many parasitic Hymenoptera, males of closely related species are often impossible to separate. Also there are several species of which I have seen no males.

1	Ocelli small, OO (ocellar-ocular distance) at least 2 times OD (ocellar diameter), usually more; tarsal claws simple (Figs 34, 35), without a distinct basal lobe but sometimes swollen at the base or with a small tubercle on the inner side of the claw; mandibles large, stout and not strongly twisted (Figs 12, 29); generally head full and rounded behind the eyes and in front view rather square, the face broad and the eyes small (but cf. Figs 2, 4, 5)	2
–	Ocelli large, OO at most 2 times OD (except in *cinctellus*); tarsal claws with a well-developed lobe (Fig. 58) (except in *consimilis* and in *rubens*); mandibles most usually small and strongly twisted (Fig. 38); generally head contracted behind eyes and in front view rather triangular in outline, being more or less contracted ventrally and the eyes large	19
2 (1)	Dorsal pits absent, the ventral borders of tergite one joined from near the base of the segment to about its midpoint (Fig. 7)	3
–	Dorsal pits present, the ventral borders of tergite one not touching, usually widely separated	5
3 (2)	Flagellar segments obconical, mostly only as long as broad, only the first segment as much as twice as long as broad; frons flattened and face strongly protuberant, forming a 'shelf' upon which the antennae are mounted (Fig. 1); propodeum strongly reticulate-rugose and without distinct carinae	***micropterus*** (Haliday) (p. 39)
–	At least the basal flagellar segments cylindrical and not less than 3 times as long as broad; face not strongly protuberant; propodeum only weakly rugose and with distinct carinae	4
4 (3)	Antennae short, 21- to 24-segmented, the three preapical segments only slightly longer than broad, submoniliform; basal segments of flagellum lighter in colour than apical segments; eyes large, convergent (Fig. 2); ovipositor about 2·5 times length of tergite one	***filator*** (Haliday) (p. 30)
–	Antennae longer, 26- to 27-segmented, all segments at least twice as long as broad, cylindrical; basal segments of the flagellum not distinctly lighter in colour than apical segments; eyes smaller, very little convergent (Fig. 3); ovipositor about 1·5 times length of tergite one	***eadyi*** sp. n. (p. 29)
5 (2)	Eyes strongly convergent, face at most as wide as high (Figs 4, 5)	6
–	Eyes not strongly convergent, face broader than high, usually about twice as broad as high	7
6 (5)	Hind tibia strongly swollen, about as wide as femur (Fig. 6); tergite one longitudinally striate, sometimes rugose medially; antennae 30- to 33-segmented; eye about 3 times as long as temple	***oculatus*** Ruthe (p. 42)



Figs 1–9 1, *Meteorus micropterus* (Haliday), head, lateral view. 2, *M. filator* (Haliday), head, frontal view. 3, *M. eadyi* sp. n., head, frontal view. 4, *M. vexator* (Haliday), head, frontal view. 5, 6, *M. oculatus* Ruthe; (5) head, frontal view; (6) hind leg. 7, *M. filator* (Haliday), segment one of gaster, ventral view. 8, *M. nixoni* sp. n., head, dorsal view. 9, *M. sulcatus* Szëpligeti, head, dorsal view. All figures × 43.

– Hind tibia not strongly swollen, distinctly narrower than femur; tergite one reticulate-rugose, occasionally with a longitudinal striate element laterally; antennae 20- to 24-segmented; eye about twice length of temple ***vexator*** (Haliday) (p. 53)

7 (5) Tergite one stout, broad at base and with spiracles distinctly before the middle, dorsal pits large (Fig. 11); tergite two usually strongly sculptured and with distinct thyridiae; hind tibia usually swollen and basally lighter in colour; ovipositor always long, at least 3 times length of tergite one 8

– Tergite one slender at base and with spiracles at about mid-segment, dorsal pits smaller; tergite two smooth, never strongly sculptured and thyridiae obsolescent; hind tibia rarely swollen or basally lighter in colour; ovipositor sometimes distinctly less than three times length of tergite one 10

8 (7) Temples shorter than eyes (Fig. 8); clypeus wide, mandibles large, not twisted (Fig. 12) ***nixoni*** sp. n. (p. 40)

– Temples longer than eyes (Figs 9, 10); clypeus narrow, mandibles short, strongly twisted 9

9 (8) Propodeum rather flat in profile, not carinate, rugose; clypeus smooth-punctate; second submarginal cell at least 1·5 times as high as wide (Fig. 13); antennae 31- to 36-segmented ***sulcatus*** Szepligeti (p. 49)

– Propodeum divided by a strong medial transverse carina into dorsal and posterior planes which are sharply angled one to the other; clypeus vertically caruncculate; second submarginal cell about as high as wide (Fig. 14); antennae 39- to 41-segmented ***corax*** Marshall (p. 28)

10 (8) Ovipositor long, at least 3·0 times length of tergite one; sternaulus reticulate-rugose or reticulate-foveolate, at least anteriorly; hind coxa generally rugose 11

– Ovipositor shorter, at most 2·5 times length of tergite one, if, rarely, slightly more (*salicorniae*) then frons depressed and face strongly protuberant (Fig. 20); sternaulus narrow, foveolate or, if broad and reticulate-rugose (*abdominator*), wings strongly infumate; hind coxa generally smooth, punctate 13

11 (10) Head subcubic, temples longer than eyes (Fig. 15); tergite one predominantly coarsely rugose with only a few striae laterally; a small species 2·5–3·0 mm in length ***jaculator*** (Haliday) (p. 36)

– Head more transverse, temples shorter than eyes or at most equal (Fig. 16); tergite one striate and with a reticulate medial longitudinal band; generally larger species 4–5 mm in length 12

12 (11) Eyes large, convergent (Fig. 17); malar space shorter than basal breadth of mandible, face about 1·5 times as broad as high; antennae short, at most 27-segmented; face generally almost completely rugulose, rarely completely punctate ***cespitator*** (Thunberg) (p. 24)

– Eyes smaller, less strongly convergent (Fig. 18); malar space about equal to basal breadth of mandible; face about twice as broad as high; antennae longer, 29- to 32-segmented; face densely punctate with at most a trace of rugulose sculpture beneath the base of the antenna ***longicaudis*** (Ratzeburg) (p. 38)

13 (10) Sternaulus broad and strongly reticulate-rugose, at least anteriorly; pronotum strongly rugose; wings infumate, the second submarginal cell strongly narrowed anteriorly; ocelli minute, OO = 3·5–4·0 times OD and head transverse (Fig. 19) ***abdominator*** (Nees) (p. 20)

– Sternaulus narrow, foveolate; pronotum generally mostly smooth; wings hyaline, the second submarginal cell only slightly narrowed anteriorly; ocelli usually larger, if minute then head not distinctly transverse 14

14 (13) Face strongly convex medially, frons depressed, occiput distinctly concave (Fig. 20) propodeum strongly reticulate-rugose with no distinctly differentiated carinae ***salicorniae*** Schmiedeknecht (p. 48)

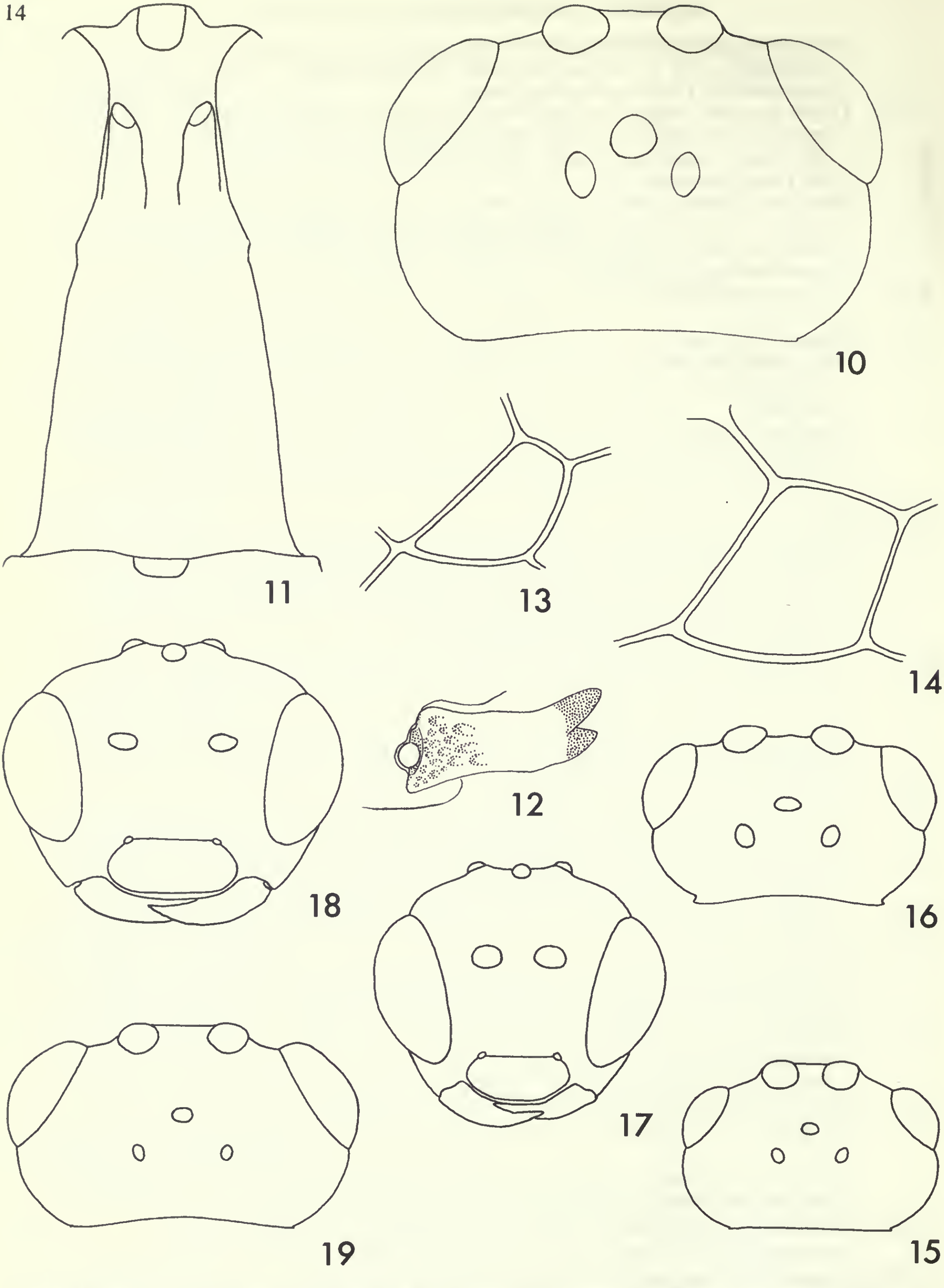
– Face evenly and only weakly convex, frons not depressed, occiput at most weakly concave; propodeum with scattered rugae and with distinct carinae 15

15 (14) Clypeus narrower than face (Figs 22, 23, 24); mandibles at least slightly twisted 16

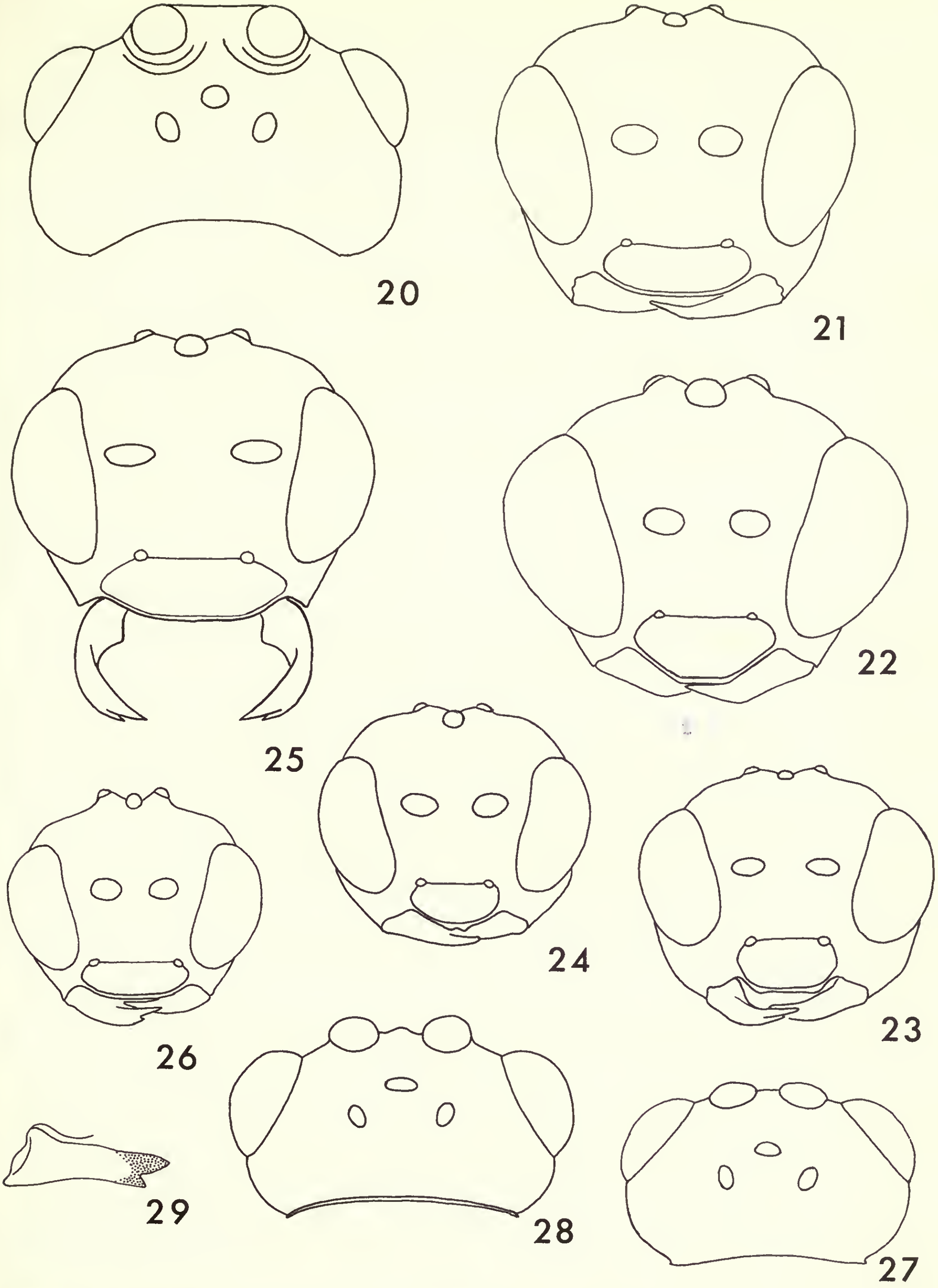
– Clypeus as broad as the face (Figs 25, 26); mandibles not twisted 18

16 (15) Antennae short, the segments in the apical half of the flagellum not longer than broad; vertex rather flat in front view (Fig. 22); eyes larger; clypeus protuberant ***obfuscatus*** (Nees) (p. 41)

– Antennae longer, at most one or two segments of flagellum not longer than broad; vertex rounded in front view (Figs 23, 24); eyes smaller; clypeus rather flat 17



Figs 10–19 10, 11, *Meteorus corax* Marshall; (10) head, dorsal view; (11) segment one of gaster, dorsal view. 12, *M. nixoni* sp. n., mandible. 13, *M. sulcatus* Szépligeti, 2nd submarginal cell of forewing. 14, *M. corax* Marshall, 2nd submarginal cell of forewing. 15, *M. jaculator* (Haliday), head, dorsal view. 16, 17, *M. cespitator* (Thunberg); (16) head, dorsal view; (17) head, frontal view. 18, *M. longicaudis* (Ratzeburg), head, frontal view. 19, *M. abdominator* (Nees), head, dorsal view. All figures × 43.



Figs 20–29 20, *Meteorus salicorniae* Schmiedeknecht, head, dorsal view. 21, *M. abdominator* (Nees), head, frontal view. 22, *M. obfuscatus* (Nees), head, frontal view. 23. *M. punctifrons* Thomson, head, frontal view. 24, *M. profligator* (Haliday), head, frontal view. 25, *M. hirsutipes* sp. n., head, frontal view. 26, 27, *M. brevicauda* Thomson; (26) head, frontal view; (27) head, dorsal view. 28, 29, *M. hirsutipes* sp. n.; (28) head, dorsal view; (29) mandible. All figures × 43 except Fig. 29 × 107.

17 (16) Frons between anterior ocellus and eye with a patch of large distinct punctures separated by less than their own diameter; height of eye at most equal to breadth of face (Fig. 23); legs conspicuously long, hind tibia and tarsus equal in length to thorax and gaster; ovipositor short, down-curved . . . . . . ***punctifrons*** Thomson (p. 46)

– Frons with smaller punctures separated by much more than their own diameter; height of eye distinctly greater than breadth of face (Fig. 24); legs not conspicuously long, hind tibia and tarsus together distinctly shorter than thorax and gaster; ovipositor slightly longer, straight . . . . ***profligator*** (Haliday) (p. 44)

18 (15) Temples about as long as eyes, less strongly contracted (Fig. 27); ovipositor 1·5 times as long as tergite one; legs short, stout; tarsal claws shorter, thicker (Fig. 34) . . ***brevicauda*** Thomson (p. 23)

– Temples distinctly shorter than eyes, strongly contracted (Fig. 28); ovipositor 2·5 times length of tergite one; legs long, slender; tarsal claws very long, slender (Fig. 35) ***hirsutipes*** sp. n. (p. 33)

19 (1) Dorsal pits absent or, occasionally, weakly indicated, the ventral borders of tergite one touching or at most with a narrow gap between them 20

– Dorsal pits distinct, the ventral borders of tergite one not touching, usually widely separated 27

20 (19) Tergite one not joined beneath at the base of the segment and either joining shortly in front of the middle of the segment or a small gap remaining (Figs. 39, 40) . . 21

– Tergite joined beneath at the base of the segment (Fig. 41) 26

21 (20) Eyes strongly convergent; ocelli small, OO about 2·5 times OD . ***cinctellus*** (Spinola) (p. 25)

– Eyes not strongly convergent; ocelli larger, OO at most 2·0 times OD 22

22 (21) Antennae short, 24- to 28-segmented; tarsal claws not strongly curved and with a very small basal lobe or with none; mandible fairly large and moderately twisted . . ***rubens*** (Nees) (p. 47)

– Antennae longer, usually with 30 or more segments; tarsal claws strongly curved and with a pronounced basal lobe; mandible small, strongly twisted 23

23 (22) Head strongly narrowed behind eyes (Figs. 31, 33); length of eye 2·5–3·0 times length of temple 24

– Head less strongly narrowed behind eyes (Figs. 36, 37); length of eye at most twice length of temple 25

24 (23) Ocelli very large, OO = 0·5 times OD (Fig. 31); head more strongly contracted behind eyes . . . . ***lionotus*** Thomson (p. 37)

– Ocelli not so large, OO = 1·0–1·5 times OD (Fig. 33); head less strongly contracted behind eyes . . . . ***heliophilus*** Fischer (p. 32)

25 (23) Clypeus evenly and densely punctate with a dense pile of erect hairs; frons not tuberculate; propodeum in lateral view rounded, strongly rugose dorsally and with no distinct carinae; recurrent antefurcal or interstitial . . . ***pulchricornis*** (Wesmael) (p. 45)

– Clypeus with scattered punctures and a few scattered long hairs; frons with a blunt tubercle in front of the fore ocellus (Fig. 44); propodeum in lateral view flattened and often with a central longitudinal carina; recurrent always distinctly postfurcal (Fig. 45) ***colon*** (Haliday) (p. 26)

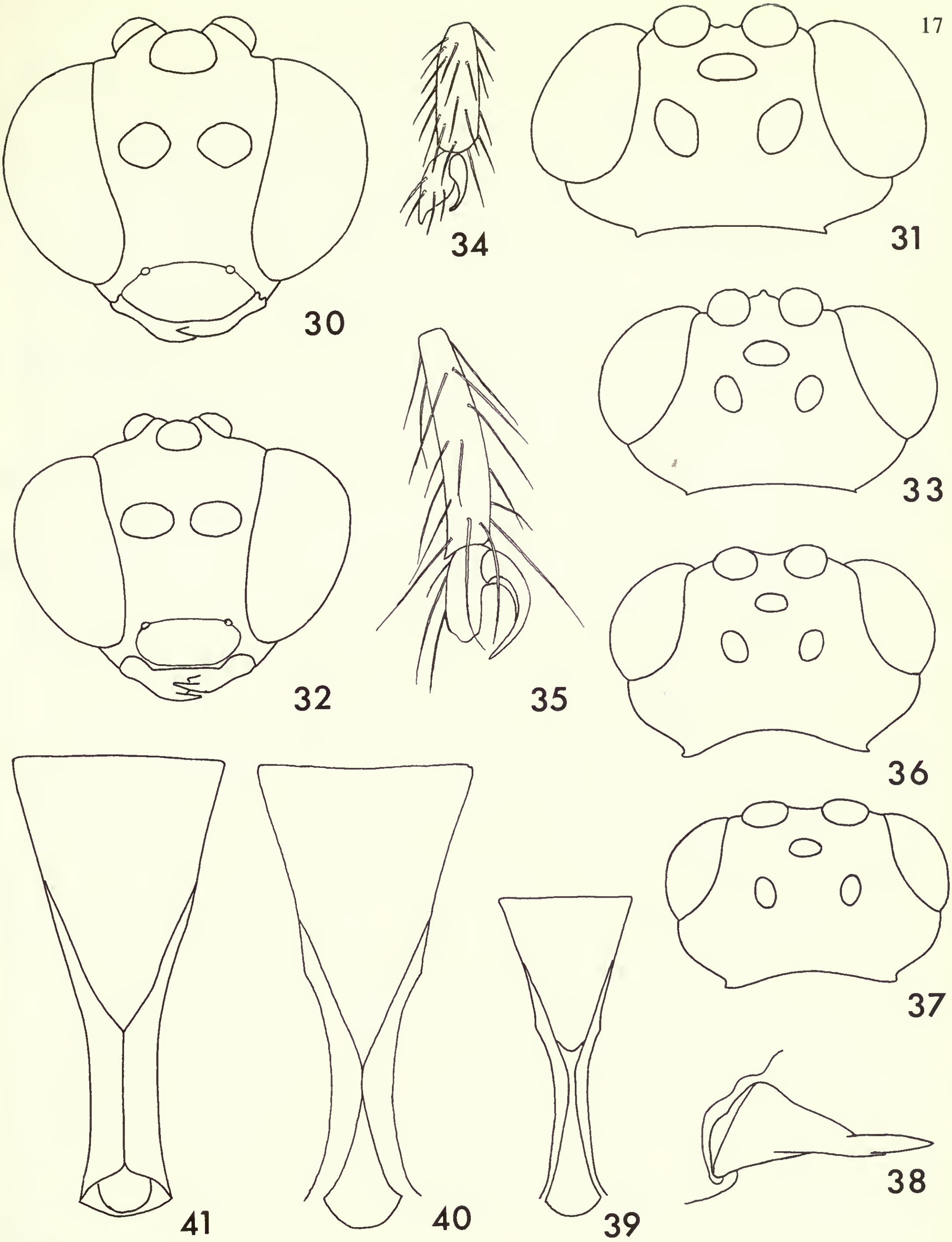
26 (20) Eyes strongly protuberant (Fig. 43), large, temple generally strongly contracted, not rounded; ovipositor thick, strongly constricted just before apex, generally short, 1·5 times length of tergite one, occasionally twice; propodeum short, wide, strongly excavate medially . . . . ***versicolor*** (Wesmael) (p. 51)

– Eyes not strongly protuberant (Fig. 42), smaller, temple not strongly contracted, rounded; ovipositor slender, not strongly constricted at apex, generally longer, 2·5 times length of tergite one but sometimes only twice; propodeum not conspicuously short and wide and only weakly excavate medially . . . . . ***obsoletus*** (Wesmael) (p. 41)

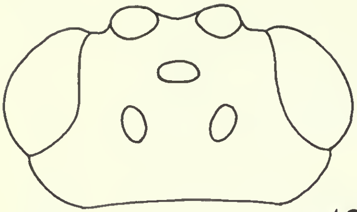
27 (19) Eyes strongly convergent or, if only moderately convergent (Fig. 52) then length of eye in dorsal view 2·5–3·0 times length of temple; ovipositor long, always at least 2·5 times length of tergite one 28

– Eyes at most moderately convergent (Fig. 56); length of eye at most twice length of temple (Figs 55, 57); ovipositor not more than twice length of tergite one 32

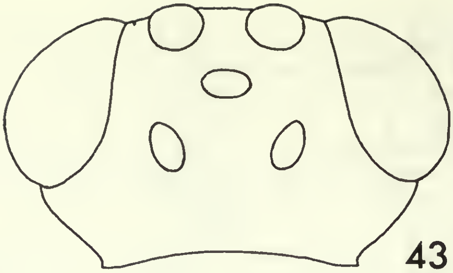
28 (27) Length of eye 4 times length of temple (Fig. 46); OO = 1·25–1·5 times OD; eyes strongly convergent (Fig. 47) . . . . ***graciliventris*** Muesebeck (p. 31)



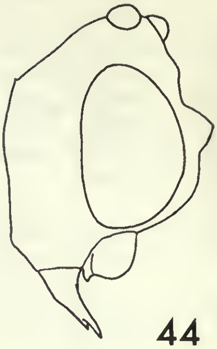
Figs 30–41 30, 31, *Meteorus lionotus* Thomson; (30) head, frontal view; (31) head, dorsal view. 32, 33, *M. heliophilus* Fischer; (32) head, frontal view; (33) head, dorsal view. 34, *M. brevicauda* Thomson, tarsal claws. 35, *M. hirsutipes* sp. n., tarsal claws. 36, *M. pulchricornis* (Wesmael), head, dorsal view. 37, *M. rubens* (Nees), head, dorsal view. 38, *M. lionotus* Thomson, mandible. 39, *M. cinctellus* (Spinola), segment one of gaster, ventral view. 40, *M. lionotus* Thomson, segment one of gaster, ventral view. 41, *M. versicolor* (Wesmael), segment one of gaster, ventral view. All figures × 43 except Figs 34, 35 and 38 × 107.



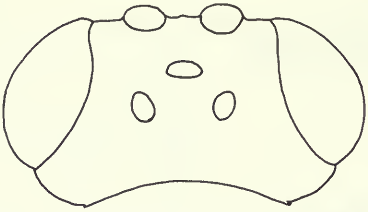
42



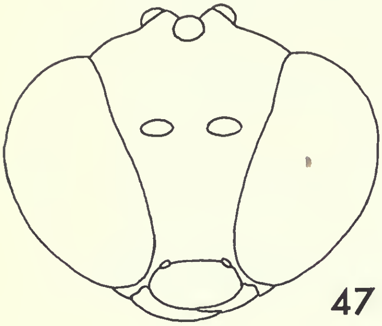
43



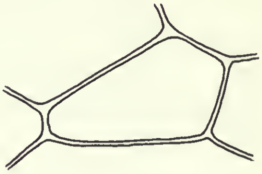
44



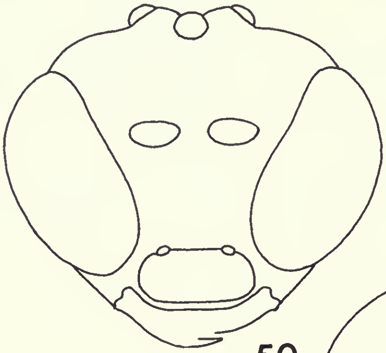
46



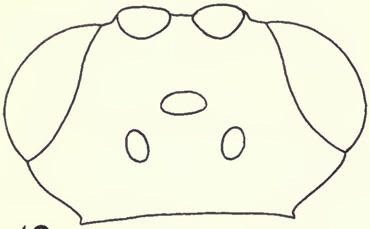
47



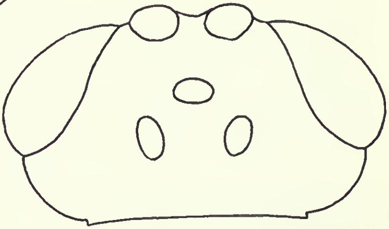
45



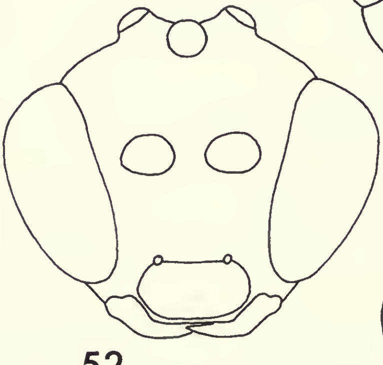
50



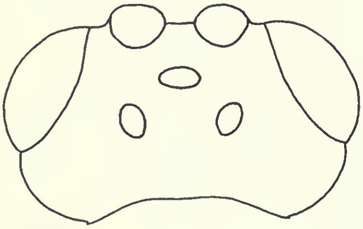
48



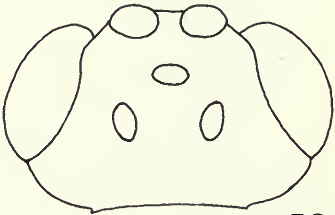
51



52



49



53

Figs 42–53 42, *Meteorus obsoletus* (Wesmael), head, dorsal view. 43, *M. versicolor* (Wesmael), head, dorsal view. 44, 45, *M. colon* (Haliday); (44) head, lateral view; (45) 2nd submarginal cell of forewing. 46, 47, *M. graciliventris* Muesebeck; (46) head, dorsal view; (47) head, frontal view. 48, *M. tabidus* (Wesmael), head, dorsal view. 49, *M. affinis* (Wesmael), head, dorsal view. 50, 51, *M. pallipes* (Wesmael); (50) head, frontal view; (51) head, dorsal view. 52, 53, *M. ictericus* (Nees); (52) head, frontal view; (53) head, dorsal view. All figures × 43.

– Length of eye at most 3 times length of temple; if OO less than 2·0 times OD then eyes only moderately convergent 29

29 (28) Outer surface of hind coxa strongly rugose or reticulate-rugose; anteriorly the mesopleuron beneath the sternaulus reticulate-rugose or reticulate-foveolate; tergite one often rugose, at least centrally 30

– Outer surface of hind coxa smooth with at most some puncturation; sternaulus foveolate, the sculpture often partly obsolescent so that the sternaulus is in part a smooth furrow; mesopleuron smooth-punctate with no reticulate sculpture beneath the sternaulus; tergite one longitudinally striate, usually without rugosity 31

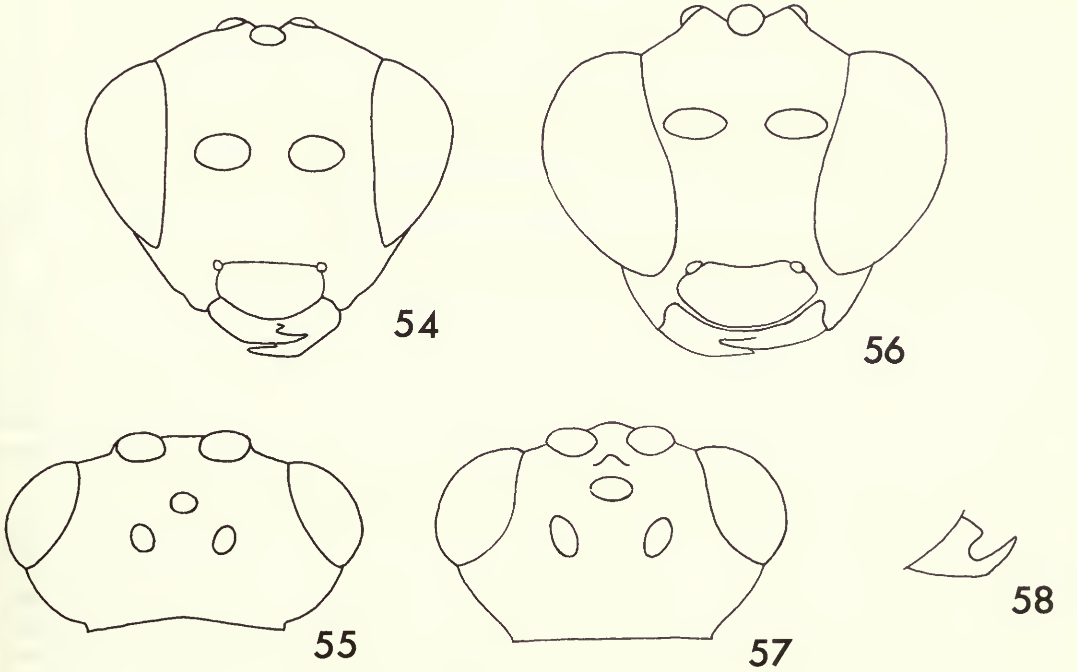
30 (29) Head in dorsal view (Fig. 48) contracted behind the eyes, not strongly rounded, the occiput not concave; vertex always with a light yellow patch on the orbit opposite the hind ocellus; mesopleuron beneath the sternaulus reticulate-rugose so that the sternaulus appears to be a broad reticulate-rugose band; pronotum laterally strongly reticulate-rugose . . . . ***tabidus*** (Wesmael) (p. 50)

– Head in dorsal view (Fig. 49) not contracted behind eyes, strongly rounded, the occiput concave; vertex rarely pale-marked; mesopleuron beneath the sternaulus rarely reticulate-rugose though often reticulate-foveolate anteriorly; pronotum laterally smooth sometimes rugose, rarely reticulate . . . . ***affinis*** (Wesmael) (p. 22)

31 (29) Eyes strongly convergent (Fig. 50); temples rounded, not strongly contracted (Fig. 51); ocelli smaller OO = 2·0 times OD . . . . . . ***pallipes*** (Wesmael) (p. 43)

– Eyes moderately convergent (Fig. 52); temples less rounded, strongly contracted (Fig. 53); ocelli larger OO = 1·0–1·5 times OD . . . . . . ***ictericus*** (Nees) (p. 34)

32 (27) Sternaulus broad, reticulate-rugose or, if narrow foveolate then length of malar space about twice basal breadth of mandible; propodeum coarsely reticulate-rugose without a distinct central longitudinal carina and frons not tuberculate; hind coxa generally strongly rugose 33



Figs 54–58 54, 55, *Meteorus consimilis* (Nees); (54) head, frontal view; (55) head, dorsal view. 56, *M. gyrator* (Thunberg), head, frontal view. 57, *M. melanostictus* Capron, head, dorsal view. 58, *M. ictericus* (Nees), tarsal claw. All figures × 43 except Fig. 58 × 107.

– Sternaulus narrow foveolate and length of malar space not more than basal breadth of mandible; propodeum weakly rugose and generally with a distinct central longitudinal carina or the frons has a blunt tubercle in front of fore ocellus; hind coxa generally smooth, punctate 35

33 (32) Malar space long, almost twice basal breadth of mandible (Fig. 54); ovipositor at most equal in length to tergite one, down-curved; second submarginal cell most usually strongly narrowed anteriorly; flagellum pale banded . . . . ***consimilis*** (Nees) (p. 27)

– Malar space shorter, not more than basal breadth of mandible; ovipositor 1·5–2·0 times length of tergite one, straight; second submarginal cell only slightly narrowed anteriorly; basal segments of flagellum sometimes paler than apical segments but never with a distinct pale band 34

34 (33) Clypeus rather flat, finely and densely punctured and with a dense erect pile; hind coxa almost completely rugose; pterostigma dark with a pale outer border . . . ***abscissus*** Thomson (p. 21)

– Clypeus protuberant, more coarsely punctate-rugulose and with scattered long hairs; hind coxa rugose only laterally; pterostigma uniformly pale . ***unicolor*** (Wesmael) (p. 51)

35 (32) Antenna longer, 30- to 34-segmented; frons with no tubercle but often with a weakly impressed line in front of fore ocellus; propodeum finely rugose, often reticulate-rugose, generally with a central longitudinal carina which, though weak, is distinct; medial transverse carina sometimes present but never strongly raised ***gyrator*** (Thunberg) (p. 31)

– Antenna shorter, 25- to 27-segmented; frons with a blunt tubercle in front of the fore ocellus (Fig. 57); propodeum more coarsely rugose, generally with no central longitudinal carina but with a strongly raised medial transverse carina . . . ***melanostictus*** Capron (p. 38)

Descriptions of species

Meteorus abdominator (Nees von Esenbeck)
(Figs 19, 21)

Perilitus abdominator Nees von Esenbeck, 1811: 24. Syntypes ♂ ♀, GERMANY (destroyed).

[*Perilitus brevipes* Wesmael; Wesmael, 1838: 141. Misidentification: see *brevipesalis* below.]

Perilitus brunnipes Ruthe, 1862: 37. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined]. **Syn. n.**

Meteorus brevipesalis Shenefelt, 1969: 55. Holotype ♀, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels) [examined]. [Proposed as a new name for '*brevipes* Wesmael, 1838'.] **Syn. n.**

I have based my interpretation of *abdominator* on specimens in Wesmael's collection labelled 'Perilitus abdominator NVE' in Wesmael's handwriting. Wesmael was the first revisor of *abdominator*.

Wesmael (1835) described *brevipes* solely from males but later (1838) he published a description of a single female which he considered to belong to *brevipes*. As pointed out by Marshall (1887: 110) this led Ruthe (1862: 34) to describe the true female of *brevipes* as *albicornis* though he expressed doubt about the correctness of his action. There is one female specimen in Wesmael's collection which agrees with Wesmael's description of the supposed female of *brevipes* and which bears a label 'Perilitus brevipes mihi' in Wesmael's handwriting. This specimen comes within the limits of variation of *abdominator*.

Ruthe (1862: 38) stated that his description of *brunnipes* was based on six female specimens. In the collection of the BMNH there are six specimens from Ruthe's collection standing above the name 'brunnipes', two of them bearing labels 'P. brunnipes M.' in Ruthe's handwriting. These specimens are conspecific and agree with Ruthe's description of *brunnipes*. They come within the limits of variation of *abdominator*. I have chosen as lectotype the specimen labelled 'BM Type Hym. 3C750'. Fischer (1970*b*: 275) suppressed *brunnipes* as a synonym of *Zemiotes deceptor* (Wesmael). The latter species has recently been synonymized with *Z. albiditarsus* (Curtis) (van Achterberg, 1979). Van Achterberg (in litt.) states that in the MNHU, Berlin there are specimens of *albiditarsus* identified as *brunnipes*. It seems probable that Fischer's interpretation of *brunnipes* was based on these wrongly-identified specimens.

♀. Antennae short, 22- 25-segmented, distal segments of flagellum only slightly longer than broad. Head slightly broader than thorax; distinctly transverse; temples contracted but not strongly so. Ocelli small, OO = 3·5–4·0 times OD. Eyes generally only slightly convergent, never strongly so. Face always transverse, about twice as broad as high; protuberant; generally rather smooth-punctate. Malar space slightly shorter than basal breadth of mandible. Tentorial pits deep. Clypeus strongly protuberant, divided from face by a deep distinct furrow, smooth with relatively few large punctures. Mandible stout, twisted. Frons depressed, usually completely smooth-punctulate but occasionally with a small patch of rugosity just above the antennal sockets and also sometimes with scattered larger punctures along the margin of the eye. Vertex polished, punctulate. Genae swollen so that the head is rather broad ventrally in front view (Fig. 21). Pronotum expanded forwards and sideways, strongly rugose, sometimes reticulate-rugose except for a smooth polished band dorsally. Mesonotum polished, punctate, the middle lobe often strongly so; notaulices deep, foveolate. Sternaulus broad, reticulate-rugose with particularly strong vertical rugae; rest of mesopleurae smooth-punctulate except for the subalar prominence. Propodeum coarsely rugose, often reticulate-rugose, at least in part; longitudinal and transverse carinae present but often obscured by the rugosity; distinctly excavate medio-posteriorly. Tergite one stout, with distinct dorsal pits; longitudinally striate dorsally, the lateral surfaces rugose at the base and sometimes also striate. Sternite of segment one thickened in its basal half and finely reticulate-rugose. Ovipositor 2·0–2·5 times length of tergite one; down-curved. Legs stout; hind coxae smooth-punctate, sometimes rugose dorsally but this rugosity often weak. Tarsal claws not strongly bent but swollen at the base. Wings short; second submarginal cell generally more or less strongly contracted anteriorly.

Colour black; legs, tegulae and usually tergite 2 and tergite 3 at base testaceous; basal flagellar segments often lighter in colour than rest, sometimes yellow. In darker specimens the legs and the tergites are darker brownish testaceous and the flagellar segments are all dark. Hind legs often darker at the apex of the femur, tibia and tarsus. Wings always at least slightly infumate, often densely so.

♂. Same as female except antennae longer, 25- to 31-segmented, all flagellar segments generally at least twice as long as broad; colour often darker.

MATERIAL EXAMINED

143 ♀, 71 ♂. **Belgium, France, Germany, Great Britain, Hungary, Ireland, Italy, Netherlands, Poland, Sweden, Switzerland.**

HOSTS. No reared material examined.

REMARKS. *M. abdominator* is superficially similar to *micropterus* and *consimilis*; this question is touched upon in the discussion of *micropterus*. *M. abdominator* is rather variable in sculptural characteristics and in venation.

Meteorus abscissus Thomson

[*Meteorus pulchricornis* Wesmael; Ruthe, 1862: 40. Misidentification.]

Meteorus abscissus Thomson, 1895: 2156. LECTOTYPE ♀, SWEDEN (ZI, Lund), here designated [examined].

Ruthe stated that he possessed one specimen of this species which he referred to *pulchricornis* though he expressed some doubt as to the correctness of his identification. There is a specimen present in the collection of the BMNH bearing a label 'P.pulchricornis Wsm' in Ruthe's handwriting which fits the description given by Ruthe of that species. Thomson (1895: 2156) stated that Ruthe's *pulchricornis* differed from that of Wesmael and put forward a new name, *abscissus,* for the former species. There are six specimens in Thomson's collection standing above the name 'abscissus' and these are conspecific with Ruthe's specimen of 'pulchricornis' and agree precisely with what Thomson wrote about *abscissus*.

♀. Antennae 30- to 33-segmented, thick at base tapering to apex, all flagellar segments distinctly longer than broad. Head broad, temples strongly contracted behind eyes, eyes at most twice length of temple Ocelli large, OO = 2 times OD. Eyes large, moderately convergent. Malar space about equal to basal breadth of mandible. Face 1·5 times as wide as high, not strongly protuberant, with weak transverse rugae though sometimes smooth, punctate laterally. Clypeus not strongly protuberant, sometimes flattened, densely and regularly punctate and with a dense erect pile. Mandibles small, strongly twisted. Pronotum laterally strongly reticulate-rugose; notaulices deep-foveolate, coalescing posteriorly to form a strongly rugose area. Sternaulus broad, reticulate-rugose, rest of mesopleuron smooth-punctate except dorsally where it is reticulate-rugose. Prepectal carina strongly raised. Propodeum broad, strongly convex, strongly reticulate-rugose dorsally and posteriorly. Tergite one long with distinct dorsal pits and shallow glymmae; dorsal surface finely striate; lateral surface at the base smooth, shining. Ovipositor 1·5–2·0 times length of tergite one, straight. Hind coxa strongly rugose, reticulate-rugose dorsally and sometimes laterally, often transversely rugose ventrally. Tarsal claws with a distinct basal lobe.

Colour brownish testaceous, legs testaceous; propodeum and tergite one sometimes black wholly or in part; thorax, head and hind coxa also sometimes black-marked.

♂. Same as ♀ except that antenna longer, 34- to 36-segmented; tergite one narrower; sculpture of hind coxa sometimes obsolescent.

MATERIAL EXAMINED

9 ♀, 4 ♂. **Austria**: 1 ♂, Südtirol, Partschins, 20.vii.1966 (*Haeselbarth*) (EH, Munich). **Hungary**: 1 ♀, Budapest, Hármashatárhegy, 6.vi.1972 (*Papp*) (HNHM, Budapest); 1 ♀, Hársbokorhegy, 15.viii.1952 (*Bajari*) (HNHM, Budapest). **Ireland**: 1 ♂, Co. Clare, Fanore, 10.vi.1974 (*West*), ex larva of *S. irrorella* (BMNH). **Italy**: 2 ♂, Riva s. Garda (*Haeselbarth*) (EH, Munich). **Sweden**: 1 ♀, Sk., Horna, 5.ix.1967 (Hedqvist) (HC, Stockholm); 6 ♀, Thomson coll. (ZI, Lund).

HOST. *Setina irrorella* (L.) (Lepidoptera: Arctiidae).

REMARKS. *M. abscissus* is structurally very close to *pulchricornis* but has a flatter clypeus and the pronotum, sternaulus, propodeum and hind coxa are more strongly rugose; it is also a rather stouter insect. *M. pulchricornis* generally has no true dorsal pits on tergite one but there is likely to be considerable difficulty in the separation of those specimens of *pulchricornis* with pits and specimens of *abscissus*.

Meteorus affinis (Wesmael)

(Fig. 49)

Perilitus affinis Wesmael, 1835: 31. Holotype ♀, BELGIUM: Brussells, coll. Wesmael (IRSNB Brussels) [examined].

Meteorus punctiventris Ruthe, 1862: 25. Holotype ♀, GERMANY: Ruthe collection (BMNH) [examined]. **Syn. n.**

Meteorus gracilis Ruthe, 1862: 31. Holotype ♀, GERMANY: Ruthe coll. (BMNH) [examined]. [Junior primary homonym of *gracilis* Ratzeburg, 1852: see *ruthei* below.]

Meteorus ruthei Schmiedeknecht, 1897: 205. [Replacement name for *gracilis* Ruthe, 1862.] **Syn. n.**

Meteorus voloscensis Fischer, 1959: 14. Holotype ♀, YUGOSLAVIA: Volosca, coll. Graeffe (NM, Vienna) [examined]. **Syn. n.**

Wesmael (1835: 31) stated that he possessed only a single female of the species. In Wesmael's collection there are three specimens labelled 'Perilitus affinis mihi' in Wesmael's handwriting. Only one of these specimens, which I consider to be the holotype, fits the description of *affinis*, therefore Fischer (1970*a*: 52) has unnecessarily designated this specimen as lectotype of *affinis*.

Ruthe (1862: 27) stated that he possessed but one female specimen of *punctiventris*. In Ruthe's collection there is one female labelled 'P. punctiventris m.' in Ruthe's handwriting; this specimen agrees with Ruthe's description and I therefore accept it as the holotype of *punctiventris*.

Ruthe (1862: 31) stated that he possessed only a single female of *gracilis*. This specimen now stands in the collection of the BMNH; it is in rather poor condition, being broken and embedded in a mass of glue. The specimen bears a label 'P. gracilis m' in Ruthe's handwriting and agrees with his description of that species. I regard this specimen as the holotype of *gracilis*; it is within the limits of variation of *affinis*.

Fischer (1959: 14) postulated that his new species *voloscensis* was related to *vexator* and cited differences in venation to support the differentiation of the two species. The large ocelli and lobed tarsal claws of *voloscensis* show that it is not closely related to *vexator*; it does, however, come well within the limits of variation of *affinis*.

♀. Antennae 27- to 30-segmented, the penultimate five or so segments only about 1·5 times as long as broad. Head strongly rounded behind eyes, occiput rather concave, length of eye at least twice length of temple. Ocelli large, OO = 1·5–2·0 times OD. Eyes large, protuberant, strongly convergent. Face about as broad as high, not protuberant, rugulose. Clypeus smooth, shining with scattered punctures, not strongly protuberant. Malar space short, much less than basal breadth of mandible. Mandible stout, moderately twisted. Pronotum smooth laterally except for a median band of strong vertical rugae, sometimes rugose ventrolaterally, rarely reticulate-rugose. Sternaulus foveolate, sometimes smooth posteriorly and, usually, anteriorly coalescing with a patch of reticulate-foveolate sculpture on the mesopleuron beneath the sternaulus, occasionally there is reticulate-rugose sculpture in this area and rarely the sculpture there is obsolete (this is characteristic of small specimens); rest of mesopleurae shining punctulate except for a subalar patch which is reticulate-foveolate. Propodeum rugose, the carinae not usually distinctly differentiated from the rugae, transverse carinae the most well-developed. Tergite one narrow, about twice as long as apically broad, with distinct dorsal pits; dorsal surface striate laterally and with a medial longitudinal band of reticulate sculpture; the lateral surface of tergite one rugose anteriorly and striate posteriorly. Ovipositor long, 3·0–3·5 times length of tergite one, slender. Legs long, slender; hind coxae rugose ventrolaterally; tarsal claws with small but distinct lobe.

Colour black; legs yellow except sometimes hind coxa black and tarsi infuscated; clypeus, mandibles, prothorax centrally and tergite two often lighter in colour, sometimes yellow; head and mesothorax occasionally also lighter in colour.

♂. Same as ♀ except antennae longer, 30- to 33-segmented; eyes smaller and not strongly convergent; temples sometimes longer and less contracted; sculpture of sternaulus and of hind coxa often obsolescent.

MATERIAL EXAMINED

46 ♀, 17 ♂. **Bulgaria, Finland, France, Great Britain, Ireland, Netherlands, Sicily.**

HOSTS. *Infurcitinea argentimaculella* (Stainton) (Lepidoptera: Tineidae) larvae feeding on moss on wall. I have also examined a single male of this species reared from a larva feeding at the base of moss on a dead tree stump and identified as either *Gelechia* sp. (Lepidoptera: Gelechiidae) or *Scoparia* sp. (Lepidoptera: Pyralidae). Marshall (1887: 108) recorded *Scoparia* as the host of this species (as *punctiventris*).

The specimens reared from *Infurcitinea argentimaculella* (5 ♀, 2 ♂, England, Kent, Faversham, 9.vii.1977 (*Bradford*) (MSC, Reading)) are considerably smaller than average specimens of *affinis*. If Marshall's record of *Scoparia* as the usual host of *affinis* is correct then the smaller size of the parasites from *Infurcitinea* corresponds to the difference in size of the two hosts.

REMARKS. The smaller specimens of *affinis* are difficult to separate from *vexator*. They have 24- to 26-segmented antennae, sternaulus and hind coxal sculpture obsolescent; in these characteristics and in size they are close to *vexator* but they have the lobed claws and larger ocelli of *affinis*. The reduction in antennae and in sculpture is no doubt a result of their reduction in size due to their choice of a small host species.

Meteorus brevicauda Thomson

(Figs 26, 27, 34)

Meteorus brevicauda Thomson, 1895: 2165. LECTOTYPE ♀, SWEDEN (ZI, Lund), here designated [examined].

Meteorus thuringiacus Schmiedeknecht, 1897: 190. Syntypes ♀, GERMANY (lost). **Syn. n.**

Meteorus mongolicus Fahringer, 1935: 10. Holotype ♀, CHINA: S. Kansu (*Hummel*) (NR, Stockholm) [examined]. **Syn. n.**

In Thomson's collection there are three conspecific specimens standing above the name *brevicauda*. I have selected as lectotype of this species the specimen labelled by Fischer as holotype. The lectotype has no locality label, the second specimen is labelled 'Satrop 3.8.81, the third 'Hbg' (=Hälsingborg).

Thomson (1896: 2165) tentatively suggested that *brevicauda* and *profligator* might be the same species. Schmiedeknecht (1897: 299) placed *brevicauda* in unquestioned synonymy with *profligator* from which it was removed, in my view correctly, by Fischer (1959: 75). Having so disposed of *brevicauda,* Schmiedeknecht was misled into describing that species as *thuringiacus*. The description of *thuringiacus* agrees precisely with *brevicauda* and with no other species and I have no doubt that the two are conspecific, although I have been unable to locate original material of *thuringiacus*. I have examined one specimen labelled 'Meteorus thuringiacus Schmiedek.' in Schmiedeknecht's handwriting but this specimen is a male and therefore could not have been part of the syntype-series which was stated to be all female.

The holotype of *mongolicus* is well within the limits of variation of *brevicauda*.

♀. Antennae 24- to 27-segmented, all segments at least slightly longer than broad. Head rounded behind eyes but not strongly contracted; length of temple about equal to length of eye in dorsal view. Ocelli small, OO = 3 times OD. Eyes not strongly protuberant, converging slightly. Malar space very short, distinctly less than half basal breadth of mandible. Face about 2 times as broad as high, rather flat, laterally punctate, medially reticulate-punctate with a trace of rugulose sculpture. Clypeus large, as wide as face, flat, polished and with scattered large punctures. Tentorial pits large. Mandibles large, stout, not twisted. Pronotum projects in front of mesonotum forming a 'neck', laterally smooth. Mesonotum short, polished, punctate; notaulices narrow, foveolate. Sternaulus foveolate, rest of mesopleuron polished, punctate. Propodeum short with distinct carinae between which are obsolescent rugae. Tergite one with distinct dorsal pits and glymmae, dorsal surface striate laterally, the striae turning inwards distally and joining the reticulate medial area of the tergite. Ovipositor short, about 1·5 times length of tergite one. Legs short, the hind coxa smooth, punctate; tarsal claws with no basal lobe but slightly swollen at the base.

Colour black except antenna at base, clypeus, mandibles, prothorax ventrally testaceous, tegulae and legs yellow.

♂. Only one specimen examined and this lacks a head; rest of body same as ♀.

MATERIAL EXAMINED

5 ♀, 1 ♂. **Austria**: 1 ♀, Südtirol, St. Peter, Ahrntal, 25.viii.1967 (*Haeselbarth*) (EH, Munich). **Germany**: 1 ♂, 'Schmiedeknecht coll.' (CNC, Ottawa). **Poland**: 1 ♀, Polanowice, 10 km N. of Wroclaw, 15.vii.1957 (*Pulawski*) (RNH, Leiden). **Sweden**: 2 ♀, Thomson coll. (paralectotypes of *Meteorus brevicauda* Thomson) (ZI, Lund); 1 ♀, Vörmland, Stöllet, 30.vi.–19.vii.1975 (*van Rossem*) (RNH, Leiden).

HOSTS. No reared material available.

Meteorus cespitator (Thunberg)

(Figs 16, 17)

Ichneumon cespitator Thunberg, 1822: 269. Holotype ♀, SWEDEN (UDE, Uppsala) [examined].

Zele atrator Curtis, 1832: folio 415. Syntypes, GREAT BRITAIN: 'Wilts, Durnford House' (NMV, Melbourne) [not examined]. [Synonymized by Roman, 1912: 289.]

Perilitus similator Nees von Esenbeck, 1834: 41. Syntypes ♀, GERMANY (destroyed). [Synonymized by Haliday, 1835: 32.]

Meteorus ambiguus Ruthe, 1862: 30. Holotype ♀, GERMANY: Ruthe coll., 4.10.55 (BMNH) [examined]. **Syn. n.**

There is one specimen in Thunberg's collection standing above the name *cespitator*. I regard this specimen as the holotype of the species. It is in poor condition but is nevertheless readily identifiable. I have based my concept of *atrator* on specimens in the BMNH collection which have been identified as that species by G. E. J. Nixon who examined Curtis' collection in 1948 and chose a type-specimen but never validated this selection by publication.

Ruthe (1862: 31) stated that he possessed one female of *ambiguus* captured on 4 October, 1855. A specimen bearing these data now stands in the collection of the BMNH; it agrees with the description of *ambiguus* and also bears a label in Ruthe's handwriting: '*P. ambiguus* m'. I regard this specimen as the holotype of the species. It comes within the limits of variation of *cespitator* except that the flagellar segments are all distinctly longer than broad.

♀. Antennae short, 23- to 27-segmented, the apical twelve or so segments of the flagellum short, not or very little longer than broad. Head transverse, temples shorter than eyes. Ocelli small, OO = 2·5–3·0 times OD. Eyes large, protuberant, convergent but not strongly so (Fig. 17). Malar space distinctly shorter than basal breadth of mandible. Face about 1·5 times as broad as high, protuberant, generally completely rugulose but sometimes smooth, punctate laterally and occasionally, especially in smaller specimens, more or less completely smooth, punctate. Clypeus not strongly protuberant but distinctly divided from face, smooth but with large punctures, these are sometimes dense, particularly at the sides of the clypeus, so that they form a reticulate-punctate pattern. Tentorial pits distinct. Mandibles large, stout, moderately twisted. Pronotum projecting in front of the mesonotum, laterally rugose but this is sometimes reduced so that the area is smooth, shining. Notaulices deep, foveolate, rest of mesonotum densely punctate. Sternaulus deep and, at least medially, irregularly reticulate-rugose, generally with a reticulate-foveolate area beneath; the sculpture of the sternaulus is sometimes obsolescent in smaller specimens; rest of mesopleurae smooth, with minute punctures. Propodeum irregularly rugose with carinae distinct in all but the most heavily sculptured specimens in which the carinae merge with the rugose sculpture. Tergite one striate dorsally, the striae turning inwards towards the apex of the tergite, occasionally joining together medially but generally coalescing in a regularly reticulate-rugose, medial longitudinal area. Ovipositor long, 3–4 times length of tergite one. Hind coxae rugose, generally strongly so but in smaller specimens the sculpture is often obsolescent; tarsal claws long, slightly swollen at base but not lobed.

Colour black; clypeus, face, prothorax ventrally often orange-testaceous, legs testaceous often the hind coxa basally and the hind tibia apically infuscate, occasionally the hind leg almost completely dark brown-testaceous; middle tergites of gaster sometimes testaceous. Some specimens from older collections have a dull reddish body colour which I suspect to be due to fading, possibly exacerbated by over-exposure to cyanide in the killing-jar (see also discussion of *consimilis* and of *filator*).

♂. No material available.

MATERIAL EXAMINED

73 ♀. **France, Germany, Great Britain, Hungary, Ireland, Luxemburg, Netherlands, Norway, Sweden.**

HOSTS. *Nemapogon granella* (L.), *Trichophaga tapetzella* L., *Tineola* sp., (Lepidoptera: Tineidae). Van Burgst recorded (as *jaculator*) the specimens reared from *T. tapetzella* L.; I have examined these specimens and consider them to belong to *cespitator*. I have also examined specimens recorded as 'probably ex *Monopis rusticella* infesting barn owl pellets' [*Monopis rusticella* (Hübner) (Lepidoptera: Tineidae)].

REMARKS. I have examined one specimen which I think probably belongs to this species but in which the eyes are less convergent and which therefore has a face almost twice as broad as high. The face is also densely reticulate-punctate and facially the specimen therefore resembles *longicaudis*. In all other structural features, however, it comes within the limits of variation of *cespitator*.

Meteorus cinctellus (Spinola)

(Fig. 39)

Bracon cinctellus Spinola, 1808: 135. Holotype ♂, ITALY (MZS, Turin) [examined].

Perilitus fuscipes Wesmael, 1835: 48. Holotype ♀, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels) [examined]. **Syn. n.**

Meteorus tenellus Marshall, 1887: 125. LECTOTYPE ♀, GREAT BRITAIN (BMNH), here designated [examined]. **Syn. n.**

Two specimens (♂ and ♀) presently stand above the name 'cinctellus' in Spinola's collection. The original description was based on a single male specimen and I therefore consider the male in Spinola's collection to be the holotype. *M. cinctellus* has been correctly interpreted by most authors although many of them have incorrectly attributed authorship of the species to Nees, who first described the female sex.

Wesmael stated that he possessed only one female specimen of *fuscipes*; one such specimen presently stands in Wesmael's collection. It is labelled 'Perilitus fuscipes mihi' in Wesmael's handwriting and agrees precisely with his description of the species except that the darker colours are somewhat faded. I regard this specimen as the holotype of *fuscipes*; it comes within the limits of variation of *cinctellus*.

Marshall (1887: 125) based his description of *tenellus* on six female specimens reared by Bignell from *Peronea* [*Acleris*] *hastiana* (L.). Two female specimens from Marshall's collection stand above the name *tenellus* in the BMNH collection. They are mounted together on a square card on the underside of which is written the host data cited by Marshall. The two specimens are conspecific and agree with the description of *tenellus* and I have no doubt that they are syntypes of that species. I have chosen the right-hand specimen as lectotype and have so marked it. Marshall distinguished *tenellus* from *cinctellus* by the relatively shorter length of the narrow proximal part of the first segment. I have found that the proportions of the first tergite exhibit considerable variation within a species and I therefore consider *tenellus* to come within the limits of variation of *cinctellus*.

♀. Antennae 24- to 29-segmented: distal flagellar segments not much longer than broad. Head contracted behind eyes, generally more or less rounded, eyes almost twice as long as temples; frons rather depressed with a blunt tubercle in front of the fore ocellus. Ocelli small, OO=2·5 times OD. Eyes large, protuberant, strongly convergent. Malar space short, clearly shorter than the basal breadth of the mandible. Face about as high as broad, sometimes smooth, punctate but often at least partly rugose, the rugae joining to form a medial tubercle just below the antennal sockets. Clypeus narrow, at most as wide as face; strongly protuberant; polished with large punctures. Tentorial pits deep. Mandible small, strongly twisted. Pronotum generally rugose, occasionally smooth, at least in part. Notaulices thin, shallow, foveolate. Sternaulus deeply impressed, foveolate, generally broadened anteriorly by a patch of reticulate-foveolate beneath; rest of mesopleuron polished, punctulate except for a reticulate area beneath the subalar prominence; mesolcus deep, foveolate. Propodeum regularly rugose, sometimes reticulate-rugose; generally with a strong medial transverse carina, other carinae usually indistinct except occasionally when the rugosity is reduced. Propodeum generally rather flat with a long dorsal surface. Tergite one long, slender in basal half; dorsal pits absent, ventral borders generally touching at about middle of segment but occasionally open; spiracles distinctly behind midpoint of segment; dorsal surface longitudinally striate, the striae generally running towards the middle of the segment distally, often reticulate-rugose at mid-segment and occasionally also at the base but more usually smooth at base. Ovipositor 2·0–2·5 times length of tergite one. Legs long, slender; hind coxae rugose, often reticulate-rugose, at least on the dorsal surface. Tarsal claws small and difficult to see but with a distinct basal lobe.

Colour black; legs and generally tergite 2 testaceous; often basal half of flagellum and head in part brownish testaceous; mesonotum around notaulices often reddish brown; hind legs occasionally dark, at least in part; wings generally slightly embrowned.

♂. Same as ♀ except antenna longer, 28- to 30-segmented; ocelli slightly larger; eyes less strongly convergent; colour often darker.

MATERIAL EXAMINED

281 ♀, 87 ♂. **Austria, Finland, France, Germany, Great Britain, Ireland, Italy, Netherlands, Portugal, Sweden, Yugoslavia.**

HOST. *Acleris hastiana* (L.) (Lepidoptera: Tortricidae).

REMARKS. The convergent eyes and small ocelli readily distinguish the female of *cinctellus* from closely related species. The male of *cinctellus* is rather similar to that of *colon*; the legs and antennae of *cinctellus*, however, are not as conspicuously long and slender as those of *colon*; the temples of *cinctellus* are more rounded, the eyes less protuberant and the sternaulus more strongly and more extensively sculptured.

Meteorus colon (Haliday)

(Figs 44, 45)

Perilitus (*Meteorus*) *colon* Haliday, 1835: 30. Syntype(s) ♀, IRELAND (lost).

Perilitus fragilis Wesmael, 1835: 52. LECTOTYPE ♂, BELGIUM: Brussels (IRSNB, Brussels), here designated [examined]. **Syn. n.**

Perilitus fasciatus Ratzeburg, 1844: 77. Syntypes ♀, GERMANY (lost). [Synonymized with *fragilis* by Ruthe, 1862: 55.]

Meteorus luridus Ruthe, 1862: 57. LECTOTYPE, ♀, GERMANY: Ruthe collection (BMNH), here designated [examined]. **Syn. n.**

I have based my interpretation of *colon* on a specimen from Stelfox's collection which was named as that species by Stelfox. The specimen agrees precisely with Haliday's description. The descriptions of *colon* and *fragilis* were both published in 1835; Dessart (1972) has shown, however, that Haliday's names were published prior to those of Wesmael and they must therefore take precedence. *M. colon* was placed in synonymy with *fragilis* by Reinhard (*in* Ruthe, 1862: 55). Fischer (1965: 21) employed this synonymy but correctly used the name *colon* for the species with *fragilis* as a synonym. Later, however, Fischer (1970*b*: 260) lifted *fragilis* from synonymy.

Wesmael stated that he had three males and one female of *fragilis*. In Wesmael's collection above this name there now stand eight specimens labelled 'Perilitus fragilis mihi' in Wesmael's handwriting. Of these eight specimens only two males agree with Wesmael's description of *fragilis* and I have chosen the better-preserved of these as lectotype. None of the other specimens can possibly belong to the syntype-series, disagreeing as they do with the description in most particulars; four of them are *consimilis* and two *abdominator*.

There are 12 specimens standing above the name *luridus* in Ruthe's collection; I have chosen as lectotype the specimen which best fits Ruthe's description of the species and which bears a label in Ruthe's handwriting 'P. luridus m.'. The lectotype and nine other specimens are conspecific with *colon,* the two other specimens are discussed under *heliophilus.*

♀. Antennae 30- to 34-segmented; long, thin, all flagellar segments at least twice as long as broad, the basal two about 4 times as long as broad. Head contracted behind eyes; temple only slightly shorter than eye in dorsal view; head between ocelli and occipital carina flattened, polished; frons with a blunt tubercle in front of the fore ocellus so that, in lateral view, the frons appears angled. Ocelli large but not conspicuously so, OO = 2 times OD. Eyes convergent but not strongly so. Malar space short, slightly less than basal breadth of mandible. Face not strongly protuberant, generally with a transverse striate-rugose element medially. Clypeus strongly protuberant; narrower than face and with widely spaced, large punctures; apical border reflexed. Mandible small, delicate, strongly twisted. Sternaulus foveolate, rest of mesopleurae polished, punctate. Propodeum finely rugose, occasionally reticulate-rugose, carinate but the carinae often weak and indistinct. Tergite one long, slender, without dorsal pits, the ventral borders approaching at the mid point of the segment but generally narrowly separated; ovipositor 1·5 times length of tergite one. Legs very long and slender; hind coxa with only a little rugosity on the dorsal surface; tarsal claws small but with a distinct basal lobe. Recurrent vein always distinctly postfurcal, the second submarginal cell rather elongate (Fig. 45).

Colour black; face, genae inner orbit, propleurae, pronotum posteriorly, mesopleuron ventrally and legs testaceous, sometimes also tergite two is this colour and occasionally the rest of the tergites, the scutellum and the propodeum. Completely yellow specimens occur infrequently.

♂. Same as ♀ except that antenna 31- to 35-segmented.

MATERIAL EXAMINED

123 ♀, 106 ♂. **France, Germany, Great Britain, Ireland, Italy, Netherlands, Sweden, Switzerland, Yugoslavia.**

HOSTS. *Ladoga camilla* (L.) (Lepidoptera: Nymphalidae); *Anticollix sparsata* (Treitschke) (Lepidoptera: Geometridae); *Nola cuculatella* (L.) (Lepidoptera: Nolidae); *Bena prasinana* (L.) (Lepidoptera: Noctuidae).

REMARKS. *M. colon* is a conspicuously slender species with very long, slender antennae and legs. The morphology, anatomy and biology of the species (under the name *fragilis*) has been excellently monographed by Madel (1963).

Meteorus consimilis (Nees)

(Figs 54, 55)

Perilitus consimilis Nees von Esenbeck, 1834: 42. Syntype(s) ♂, GERMANY (destroyed).

Perilitus brevipes Wesmael, 1835: 33. LECTOTYPE ♂, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels), here designated [examined]. [Synonymized with *albicornis* Ruthe by Marshall, 1887: 110.]

Meteorus albicornis Ruthe, 1862: 34. LECTOTYPE ♀, GERMANY: Ruthe collection (BMNH), here designated [examined]. [Synonymized with *consimilis* by Thomson, 1895: 2160.]

There are four specimens in Wesmael's collection labelled 'Perilitus brevipes mihi' in Wesmael's handwriting. Three of these specimens are males, one of them extensively damaged; the two others are conspecific and agree with the description of *brevipes,* both coming well within the limits of variation of *consimilis.* Ruthe (1862: 35) indicated that he had two specimens of *albicornis*; these are now present in the BMHH collection. I have chosen as lectotype the specimen bearing Ruthe's handwritten labels 'P. albicornis m.' and '6.10.55' which has previously been labelled as type of the species (3C 753).

♀. Antennae 32- to 33-segmented; thick, from about the fifteenth the apical segments of the flagellum are quadrate or even a little broader than long. Head strongly contracted behind eyes; temples about equal in length to eyes in dorsal view; frons depressed so that antennae are set upon a shelf, the antennal sockets surrounded by concentric rugae which sometimes extend down onto the face. Ocelli large, OO = 1·5 times OD. Eyes small, not convergent (Fig. 54). Malar space long, almost twice basal breadth of mandible. Face protuberant, punctate, sometimes reticulate-punctate laterally. Clypeus strongly protuberant, polished, punctate, narrower than face. Tentorial pits deep. Mandibles slender; strongly twisted with, at base of teeth, a small but distinct tubercle-like swelling which terminates the ventral longitudinal carina of the mandible. Notaulices deep, narrow, foveolate. Sternaulus deep, broad, reticulate-rugose or sometimes foveolate with scattered rugae and foveae beneath. Propodeum strongly reticulate-rugose with no distinct longitudinal carinae but generally with a basal transverse carina and sometimes with a medial transverse carina which divides the dorsal and posterior faces of the propodeum, the latter generally concave. Tergite one short, wide, with distinct dorsal pits, dorsal surface strongly longitudinally striate. Ovipositor short, at most equal in length to tergite one; thick at base, tapering to apex, down-curved. Legs thick, hind tibia swollen, only slightly less broad than femur; hind coxa strongly sculptured, usually reticulate-rugose; tarsal claws strongly curved, without a basal lobe but strongly thickened at base. Wings infumate, short, the second abscissa of the radius short so that the second submarginal cell is strongly narrowed anteriorly even occasionally triangular.

Colour: antennae marked with a band of pale yellow which usually covers the basal half of the flagellum but is sometimes restricted to the middle segments; head, thorax and tergite one piceous, remaining tergites and legs testaceous.

♂. Same as female except that the antennae are longer, 32- to 36-segmented, all segments of the flagellum are distinctly longer than broad; there is never a pale band on the flagellum though the basal segments may be slightly lighter in colour than the rest; colour slightly darker; hind tibia less strongly swollen; punctures on face smaller so that the face appears smoother and shinier.

MATERIAL EXAMINED

170 ♂, 9 ♀. **France, Germany, Great Britain, Hungary, Ireland, Netherlands, Sardinia, Sweden.**

HOST. I have examined no reared material of this species. It has frequently been reported as a parasite of *Scolytus multistriatus* (Marsham) (Coleoptera: Scolytidae).

REMARKS. The darker parts of this species are dense pitchy black in freshly caught specimens; in older specimens this colour seems lighter and more reddish. Specimens from Ruthe's collection have all faded to red while a few of the specimens collected in Sweden in 1938 by Perkins are distinctly reddish and most show some evidence of such a change. The pale-banded antennae and the extremely short ovipositor at once distinguish the female of *consimilis* from all other European species of *Meteorus*. The shape of the head is also most characteristic in both sexes.

Meteorus corax Marshall

(Figs 10, 11, 14)

Meteorus corax Marshall, 1898: 220. LECTOTYPE ♀, SWITZERLAND: 'Val Somvix/25.vii.1891/Marshall det.' (NMB, Berne), here designated [examined].

Meteorus monochami Fischer, 1957c: 17. Holotype ♀. AUSTRIA: Lunz (*Haberfelner*), ex *Monochamus saltuarius* Gebl. (ZSBS, Munich) [not examined]. [Synonymized by Fischer, 1966: 395.]

Marshall stated that he had five specimens before him when describing *corax*, three from Lunz, Austria (Konow collection) and two from Val Somvix, Switzerland. The Konow collection is now housed in Eberswalde and there is in that collection a series of six specimens standing above the name *Meteorus corax*; each of these specimens bears a label 'Col. Konow' and five of them are labelled 'Lunz'. It is not now possible to distinguish Marshall's three syntypes from amongst these six specimens nor is it possible therefore to select a lectotype or paralectotypes from them. Marshall gave the depository for the Swiss specimens of *corax* as the 'Musée National de Berne' but there has never been an institution so entitled (Volkart, *in litt.*). In the collection of the NMB, Berne, however, there are three specimens standing above the name *Meteorus corax*, all with locality labels which bear the data published by Marshall and two of them also labelled 'Marshall det'. I believe the two latter specimens to belong to the syntype-series of *corax* and that Marshall misquoted the name of the depository. The six Konow specimens are conspecific with those in Berne and all agree closely with the description of *corax* except that they all have large distinct dorsal pits whereas Marshall states 'Premier segment de l'abdomen sans rainures trachéales'. I believe that the evidence for the identity of *corax* given above is sufficient to allow this statement to be discounted as being erroneous. I have examined a paratype of *monochami* and it is clearly conspecific with *corax*, as pointed out by Fischer.

♀. Antennae 39- to 41-segmented, long, all segments at least 1·5 times as long as broad. Head expanded behind the eyes, rather square in face view. Ocelli small, OO about 3 times OD. Eyes small, converging only very slightly. Face about twice as long as broad. Clypeus distinctly narrower than face; protuberant; dorsal surface smooth and punctate; ventral surface strongly carunculate. Tentorial pits wide and deep. Mandibles very stout, twisted, with striate-punctate sculpture and long hairs. Pronotum strongly rugose, becoming reticulate-foveolate posteriorly. Mesonotum punctate; notaulices slender but distinctly impressed, foveolate. Sternaulus deep, foveolate with, anteriorly, a reticulate-foveolate patch beneath, rest of mesopleurae smooth, punctate except for a reticulate-rugose patch dorsally. Propodeum strongly reticulate-rugose with basal and medial transverse carinae; medial carina extremely prominent, dividing the propodeum into dorsal and posterior planes; there is also usually a rather indistinct central longitudinal carina. Tergite one with longitudinal strigose sculpture laterally, reticulate-rugose centrally; spiracles distinctly before the middle; large dorsal pits present, borders of tergite one not meeting beneath. Tergite two longitudinally striate, becoming reticulate-rugose basally; thyridia present at about mid-point of tergite; laterotergites large. The ovipositor about 4 times length of tergite one. Outer surface of hind coxa and femur densely reticulate-punctate; hind tibia strongly swollen though not as wide as femur; tarsal claws large, strongly curved, not lobed but strongly swollen at base. Second submarginal cell as high exteriorly as wide anteriorly (Fig. 14).

Colour black, foreleg usually and midleg sometimes testaceous, hind leg always black except for an ivory band around base of tibia.

♂. No material examined.

MATERIAL EXAMINED

27 ♀ **Austria:** 1 ♀, Lunz (*Haberfelner*) 'aus Monocham. saltuarius' (ZSBS Munich) (paratype of *Meteorus monochami* Fischer); 5 ♀, Lunz 'Konow coll.' (IP, Eberswalde); 1 ♀, 'Konow coll.' (IP, Eberswalde). **Germany**: 'Parasit von *Mon. sartor* F.', no other data (EH, Munich), **Sweden**: 18 ♀, Dlr. Rättvik, Mun. Samh. t. (*Tjeder*) (5 in BMNH, rest in NR, Stockholm). **Switzerland**: 1 ♀, Val Somvix, 25.vii.1891, 'Marshall det.' (NMB, Berne) (paralectotype of *Meteorus corax* Marshall); 1 ♀, Val Somvix, 25.vii.1891 (NMB, Berne).

HOSTS. *M. corax* has been recorded from two species of *Monochamus* Guérin-Méneville (Coleoptera: Cerambycidae). The possession of a long ovipositor is often correlated with the use of wood-boring larvae as hosts.

REMARKS. This is the largest species of *Meteorus*, at least in the Palaearctic region, averaging about 9·0 mm in head and body length. It is exceptionally dark in colour, the legs generally largely black.

Meteorus eadyi sp. n.

(Fig. 3)

♀. Antennae 26- to 27-segmented, all segments at least twice as long as broad. Head rounded behind eyes. Ocelli small, OO = 2·5–3·0 times OD. Eyes small, protuberant, not strongly convergent (Fig. 3). Face about 1·5 times as broad as high; punctate, usually with transverse rugae beneath antennal sockets. Clypeus not strongly protuberant, smooth with sparse punctures; the apical border produced laterally into a small flange (Fig. 3). Mandible not twisted, polished, the upper tooth rather long. Pronotum expanded forwards so that it projects beyond the mesonotum; smooth laterally with coarse rugae dorsally. Notaulices thin, foveolate. Sternaulus foveolate, rest of mesopleurae polished, punctate. Propodeum with three longitudinal and two transverse carinae with scattered rugae between. Tergite one long, slender, about twice as long as apically broad; without dorsal pits; spiracles distinctly behind the middle; borders of tergite one conjoined beneath from just behind the base of the segment to just in front of the spiracles; dorsally the tergite rugose or reticulate-rugose with longitudinal striae laterally, particularly in apical half of segment. Ovipositor short, about 1·5 times as long as tergite one, down-curved. Legs slender, hind coxae rugose, at least on the outer surface at the base; tarsal claws without a basal lobe.

Colour black; clypeus, pronotum ventrally and legs testaceous, basal segments of the antennae usually slightly lighter than the rest.

♂. Same as ♀ except that the eyes are smaller and less convergent.

MATERIAL EXAMINED

35 ♀, 2 ♂. Holotype ♀, **Great Britain**: Northamptonshire, Spratton, x.1975 (*Gauld*) (BMNH).

Paratypes. **Bulgaria**: 1 ♀, Rhodopi, Markovo, 13.viii.1977 (*Zaykov*) (ZC, Plovdiv). **Great Britain**: 17 ♀, 1 ♂, England, Northamptonshire, Spratton, v.-x.1975 (*Gauld*) 1 ♀, E., Oxfordshire, Waterferry Common, 5.viii.1969 (*Brock*) (BMNH); 1 ♀, E., Greater London, Kew, 22.vii.1979 (*Eastop*) (BMNH). **Germany (West)** : 1 ♀, Bonn, Waldhauhohenweg, 18.xi.1960 (*Schmidt*) (CNC, Ottawa). **Netherlands**: 6 ♀, Wijster (opp. biol. station); 3, 13–26.viii.1973; 1, 7–14.vii.1974; 1, 10–17.ix.1976; 1, 16–23.vi.1978 (*van Achterberg*) (RNH, Leiden); 7 ♀, Waarder (ZH), Oosteinde; 1, 1–15.ix.1973; 1, 17–22.vi.1974; 1, 1–5.viii. 1974; 2, 1–6.ix.1974; 1, 15–22.vi.1975; 1, 21–31.x.1975 (*van Achterberg*) (RNH, Leiden); 1 ♀, Ede, 15.ix.1970 (*Zwakhals*) (RNH, Leiden). **Yugoslavia**: 1 ♀, Plitvice, 4–10.vii.1955 (*Coe*) (BMNH).

Non-paratypic material. **France**: 1 ♀, Chartrettes, 26.viii.1949 (*Granger*) (MNHN, Paris). **Great Britain**: 1 ♂, Wales, MM, Govilon, Marshall coll. (BMNH).

HOSTS. No reared material examined.

REMARKS. The structure of the thorax, of the propodeum and of tergite one show this species to be very closely related to *filator* with which it has often been confused in collections. *M. eadyi* can be distinguished, however, by its smaller, less convergent eyes, by the form of its clypeus and of its antennae and by its shorter ovipositor.

Haliday (1835: 33) noted the similarity between his species *filator* and *delator*. The close resemblance to *filator* of the species here described at first led me to suppose that it might be *delator*, which has never been adequately interpreted. In the description of *delator*, however, it is clearly stated that the ovipositor is as long as the abdomen [gaster] which is certainly never the case in *eadyi*.

Meteorus filator (Haliday)

(Figs 2, 7)

Perilitus (*Meteorus*) *filator* Haliday, 1835: 32. Holotype ♀, IRELAND: 'British Haliday 20.2.82' (NMI, Dublin) [examined].

Perilitus laticeps Wesmael, 1835: 47. LECTOTYPE ♀, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels), here designated [examined]. [Considered valid species by Fischer, 1970*a*.] **Syn. n.**

Meteorus hodisensis Fischer, 1970*b*: 285. Holotype ♀, AUSTRIA: 'Bgld., Markt. hodis, Rechnitz, 7.viii.1961' (*Fischer*) (NHM, Vienna) [examined]. **Syn. n.**

The only specimen of this species in the Haliday collection is that labelled as '♀ type' by Stelfox in 1948. I therefore regard it as the holotype. The specimen is glued onto a rectangular piece of card and is in an excellent state of preservation but is rather dirty.

As pointed out by Fischer (1970*a*) there are two broken specimens in Wesmael's collection which are labelled 'Perilitus laticeps mihi' in Wesmael's handwriting. Neither of the specimens has a head but glued to the label of one of them is the head which was illustrated by Fischer (1970*a*: 53) in his redescription of *laticeps*. Largely on the basis of this head Fischer lifted *laticeps* from synonymy with *filator*, where it had been placed by Marshall (1887: 121). The head on the label does not agree, however, with what Wesmael (1835: 47) said about the head of *laticeps* and I consider it to have been mistakenly associated with the specimen on the pin. The parts of the specimen which remain on the pin are without doubt conspecific with *filator*, the head glued to the label is that of a male *consimilis*. I consider Marshall's synonymy of the two species further evidence in support of my view; Marshall had examined Wesmael's collection and he also knew *filator* and so gross a difference as that presented by the misassociated head is unlikely to have escaped his notice. Fischer also stated that one of the specimens possessed a gaster; this is unfortunately no longer present. The holotype of *hodisensis* falls within the range of variation of *filator*.

♀. Antennae 21- to 25-segmented, short; first two flagellar segments about 3 times as long as broad, five preapical segments only slightly longer than broad, submoniliform. Head broad, temples rounded. Ocelli small, OO = 2·5–3·0 times OD. Eyes large, strongly convergent (Fig. 2). Face about as wide as high, not strongly protuberant, rugose, at least centrally, sometimes punctate laterally. Clypeus wide, polished, sparsely punctate, not strongly protuberant. Malar space short, distinctly less than half the basal breadth of mandible. Mandible large, not twisted. Pronotum projects forwards beyond the mesonotum and is slightly expanded sideways, strongly rugose. Mesonotum short, smooth; notaulices deep thin foveolate furrows. Sternaulus wide, foveolate, often with scattered rugae and foveae above and beneath; sculpture occasionally obsolescent. Propodeum rather depressed with two transverse and three longitudinal carinae, rugose between. Tergite one long, almost equal in length to rest of gaster, slender, 2·0–2·5 times as long as apically broad, ventral edges conjoined from near base of segment to its midpoint (Fig. 7), rugose dorsally with laterally in the apical half of the segment a longitudinal striate element which occasionally replaces the medial rugosity;

spiracles distinctly shortly behind mid-segment. Ovipositor long, 2·5 times length of tergite one. Legs long, slender; hind coxa reticulate-rugose, at least dorso-laterally; tarsal claws simple, long, slightly swollen at base. Wings large with a faint brown tinge; recurrent antefurcal, rarely interstitial.

Colour black except base of antennae, clypeus, mandibles, palpi, anterior margin of pronotum and legs yellow; hind coxa usually darker, at least in part, and rest of hind leg may be infuscated. Antennae and face occasionally completely yellow; in these lighter coloured specimens the pronotum is more extensively yellow though never completely so. I have seen one specimen in which the normally black parts of the body are deep reddish brown; this is probably an artefact such as is not uncommon in black insects which have been exposed overlong to cyanide in a killing bottle.

♂. Like the ♀ except eyes are smaller and less convergent so that the face is about twice as broad as high and the malar space longer; antennae longer, 27- to 30-segmented, all segments of flagellum at least twice as long as broad, darker in colour, rarely distinctly yellow in basal half of flagellum.

MATERIAL EXAMINED

130 ♀, 40 ♂. **Austria, Bulgaria, France, Germany, Great Britain, Ireland, Italy, Netherlands, Norway, Sweden.**

HOSTS. No reared material examined.

REMARKS. The characteristic first segment of the gaster, the shape and size of the eyes and of the antennal segments at once distinguish *filator* from all other species.

Meteorus graciliventris Muesebeck

(Figs 46, 47)

Meteorus graciliventris Muesebeck, 1954: 62. Holotype ♀, JAPAN: Chosen (USNM, Washington, 62029) [not examined].

Through the courtesy of Dr P. M. Marsh I have been able to examine seven female paratypes of this species.

♀. Antennae 31- to 33-segmented, the penultimate six or so segments not much longer than broad. Head strongly narrowed behind the eyes, the temples short, the eyes at least four times the length of the temple. Ocelli large, OO 1·25–1·50 times OD. Eyes very large, protuberant, strongly convergent so that the malar space is almost obliterated. Frons and vertex densely, regularly punctured. Face distinctly higher than wide, reticulate-punctate with some rugosity beneath the antennal sockets. Clypeus not strongly protuberant, smooth, with scattered large punctures. Tentorial pits small, very close to eye margin. Mandibles small, moderately twisted. Pronotum laterally coarsely rugose except for a polished punctate area dorsally. Sternaulus deeply impressed, foveolate, broadened anteriorly by a patch of reticulate-foveolate sculpture on the mesopleurae beneath the sternaulus, rest of mesopleurae shining punctate except for a subalar patch of rugosity. Propodeum broad, coarsely rugose, the carinae not distinctly differentiated. Tergite one long, slender, with dorsal pits, coarsely striate laterally and with a median longitudinal rugulose band. Ovipositor 3 times length of tergite one. Hind coxae strongly sculptured, usually reticulate-rugose; tarsal claws not strongly curved and with a small, inconspicuous basal lobe. Colour black; antennae, mandibles, palps, tergite two and legs testaceous except for the hind coxa, femur and tarsus distally which are infuscated.

♂. No material examined.

MATERIAL EXAMINED

Japan: 7 ♀, Yokohama, vii.1939, paratypes of *Meteorus graciliventris* Muesebeck (USNM, Washington).

HOST. *Pectinophora gossypiella* Saunders (Lepidoptera: Gelechiidae).

REMARKS. The singular thing about *graciliventris* is that the paratypes are the progeny of the holotype, having been bred in the laboratory in *Ephestia cautella* (Walker) (Lepidoptera: Pyralidae).

Meteorus gyrator (Thunberg)

(Fig. 56)

Ichneumon gyrator Thunberg, 1822: 261. Holotype ♂, SWEDEN (UDE, Uppsala) [examined].

Perilitus scutellator Nees von Esenbeck, 1834: 38. Syntypes ♂ ♀, GERMANY (lost). [Synonymized by Roman, 1912: 289.]

[*Meteorus melanostictus* Capron *in* Marshall, 1887: 115. Males only from type-series.]
Meteorus parvulus Thomson, 1895: 2156. Holotype ♀, SWEDEN: Öland (ZI, Lund) [examined]. **Syn. n.**

There is a single specimen of *gyrator* in Thunberg's collection and, although it is in poor condition, it is readily identifiable. I regard this specimen as the holotype of the species. There is a single specimen in Thomson's collection standing above the name *parvulus* which agrees with Thomson's description of that species and which is labelled 'Ö' (=Öland, the type-locality). I regard this specimen as the holotype of *parvulus*; it is rather smaller than the average specimen of *gyrator* but has all the structural features of that species and I have no doubt that the two are conspecific.

♀. Antennae long, 30- to 33-segmented, at most the two penultimate segments of the flagellum less than twice as long as broad. Head always contracted behind eyes, occasionally strongly rounded; temple always at least a little shorter than eye in dorsal view, eye never more than twice as long as temple. Frons with a short, shallow depression in front of fore ocellus. Ocelli large, OO = 1·0–1·5 times OD (exceptionally OO = 2 times OD). Eyes large, protuberant, generally but little convergent. Malar space a little less than basal breadth of mandible. Face generally a little broader than high, moderately protuberant, densely punctate, even reticulate-punctate, sometimes with some rugosity medially. Clypeus strongly protuberant, densely punctate, divided from the face by a deep fold. Mandibles long, strongly twisted. Pronotum projecting a little in front of the mesonotum, laterally rugose though this is occasionally largely obsolescent. Notaulices anteriorly broad, reticulate-rugose, coalescing posteriorly into a broad reticulate-rugose area which is rather depressed below the level of the lateral lobes of the mesonotum; rest of mesonotum polished, densley punctate, sometimes with a weak rugulose element, particularly on the lateral lobes. Sternaulus narrow, foveolate, occasionally broadened anteriorly by reticulate-foveolate patch beneath and, occasionlly, with some rugae; rest of mesopleurae smooth with minute punctures except for a rugose area beneath the subalar prominence. Propodeum broad, generally rather flat, densely but finely rugose, sometimes reticulate-rugose with a central longitudinal carina which is sometimes weak and occasionally broken but always present, at least in part; the rugosity is occasionally coarse but is then sparse and not reticulate. Tergite one with distinct dorsal pits; dorsal surface strongly striate; lateral surface rugose at base, striate apically; glymmae shallow. Ovipositor short, 1·5–2·0 times length of tergite one, thick, strongly swollen at base. Legs long, thin; hind coxa smooth, punctate, often with a trace of weak rugosity laterally, occasionally with stronger rugosity dorsally, but never strongly reticulate-rugose. Tarsal claws always with a basal lobe but this is often difficult to see because the claws are rather small and often partly buried in the hair of the apical tarsal segment. Wings never infumate, even in the darkest-bodied specimens; the pterostigma always uniformly pale testaceous.

Colour black; face, clypeus, genae anteriorly, vertex laterally, thorax ventrally, scutellum and tergites 2 and 3 orange-testaceous, legs yellow; few darker specimens occur and I have seen none in which the scutellum is not light in colour; completely testaceous specimens are not uncommon and all intermediate patterns occur.

♂. Same as ♀ except eyes smaller and malar space longer; propodeum often more coarsely sculptured; colour often darker, the pterostigma generally dark, often with a pale border.

MATERIAL EXAMINED

220 ♀, 201 ♂. **Austria, Bulgaria, Cyprus, Finland, France, Germany, Great Britain, Hungary, Ireland, Netherlands, Sweden.**

HOSTS. *Lycophotia porphyrea* (Denis & Schiffermüller), *Diarsia brunnea* (Denis & Schiffermüller), *Ipimorpha retusa* (L.), *Xestia xanthographa* (Denis & Schiffermüller), *Mythimna* sp., *Lacanobia oleracea* (L.), *Agrochola lota* (Clerck), *Euplexia lucipara* (L.), *Cosmia trapezina* (L.), *Thalpophila matura* (Hufnagel), *Cleoceris viminalis* (Fabricius) (Lepidoptera: Noctuidae).

REMARKS. *M. gyrator* is superficially similar to *pulchricornis*, being similar in stature and in colour. The clypeus of *gyrator*, however, is shining with scattered punctures and hairs, quite unlike that of *pulchricornis*; *gyrator* also has a deeply impressed, narrow, foveolate sternaulus (whereas that of *pulchricornis* is shallow rugose), a more depressed and generally more finely rugose propodeum and a uniformly pale stigma, at least in the female (the stigma in *pulchricornis* is dark and pale-bordered).

Meteorus heliophilus **Fischer**

(Figs 32, 33)

Meteorus heliophilus Fischer, 1970*b*: 284. Holotype ♀ AUSTRIA: Burgenland, Rechnitz, 2.viii.1958 (*Fischer*) (NM, Vienna) [examined].

Among Ruthe's material of *luridus* two specimens stand which are quite distinct from the other specimens of that species. One of these specimens bears a label '*pallidus*' in Ruthe's handwriting and I take this to indicate that Ruthe considered this specimen to be his var. *pallida* of *luridus*. These two specimens of Ruthe's are clearly conspecific with *heliophilus* which is the species misidentified as *luridus* Ruthe by Marshall (1887), by Lyle (1914) and by Tobias (1976).

♀. Antennae long 30- to 32-segmented, all segments of flagellum clearly much longer than broad. Head strongly contracted behind eyes. Eye in dorsal view 2·5–3·0 times as long as temple. Ocelli large, OO = 1·0–1·5 times OD. Eyes large, protuberant, not strongly convergent. Malar space short, less than half basal breadth of mandible. Face about as broad as high, not strongly protuberant, slightly raised medially where it is transversely rugose, laterally punctate. Clypeus protuberant though not strongly so, smooth with scattered coarse punctures. Tentorial pits small, indistinct. Mandibles strongly twisted, the upper tooth not conspicuously long. Pronotum laterally smooth with a little fine rugose sculpture medially. Mesonotum punctate, sometimes the central lobe reticulate-punctate, at least in part; notaulices weakly impressed. Sternaulus weakly rugose, sometimes obsolescent posteriorly. Propodeum shining with weak carinae and weak, largely obsolescent rugae dorsally. Tergite one long, slender, ventral borders meeting beneath at the mid-part of the segment, not joined at the base of the segment; dorsal surface weakly longitudinally striate; no glymmae or dorsal pits. Ovipositor about twice length of tergite one, thick, strongly expanded at the base and the apical sixth much narrowed. Legs long, slender; hind coxa mainly smooth but sometimes with a trace of rugosity dorsally. Tarsal claws with a distinct basal lobe.

Colour testaceous, the legs generally a paler shade of yellow.

♂. Same as ♀ except antennae 31- to 33-segmented.

MATERIAL EXAMINED

34 ♀, 21 ♂. **Bulgaria**: 1 ♀, Rhodopi, Velingrad, 20.x.1977 (*Zaykov*) (ZC, Plovdiv). **Germany**: 4 ♀, Harz, 27.iv.1957 (*Hinz*), ex *Agrotis triangulum* (BMNH); 2 ♀, Ruthe coll. (BMNH). **Great Britain**: 27 ♀, 19 ♂, England, Hampshire, New Forest (*Lyle*) (BMNH).

HOSTS. *Polia nebulosa* (Hufnagel), *Lithophane ornitopus* (Hufnagel), *Noctua fimbriata* (Schreber), *Xestia triangulum* (Hufnagel), *Orthosia stabilis* (Denis & Schiffermüller) (Lepidoptera: Noctuidae). Both Lyle (1914) and Tobias (1976) recorded this species as being gregarious, several parasite larvae developing in one host caterpillar.

REMARKS. *M. heliophilus* is structurally very close to *lionotus* but the differences in head shape between the two species together with the characteristics given in the key to species amply distinguish them. The two species also have a different host-spectrum and *heliophilus* is gregarious and *lionotus* solitary. *M. heliophilus* is also close to *rubens* and shares the latter's gregarious habit and use of noctuids as hosts. *M. rubens*, however, has shorter antennae, smaller eyes and ocelli and less strongly contracted temples than *heliophilus*. The three species are clearly closely related.

***Meteorus hirsutipes* sp. n.**

(Figs 25, 28, 29, 35)

♀. Antennae 28- to 30-segmented, thin, all flagellar segments longer than broad, the three basal ones at least 3 times as long as broad. Head strongly narrowed behind eyes, temples distinctly shorter than eyes in dorsal view; occiput concave. Ocelli small, OO = 3 times OD. Eyes protuberant, slightly convergent. Face about twice as broad as high, not strongly protuberant. Clypeus not strongly protuberant, as broad as face, punctate. Mandible very large, stout and not twisted. Prothorax projecting before the mesonotum with strong vertical rugae laterally. Mesonotum polished with fine punctures; notaulices deep, narrow, foveolate. Sternaulus deep, foveolate, angled sharply upwards in its anterior half; rest of mesopleurae polished, punctured. Propodeum with strong longitudinal and transverse carinae with a few weak rugae between, posteriorly with strong, mainly vertical rugae. Tergite one with coarse longitudinal striae, the innermost striae turn inwards posteriorly and join to form a transverse rugose area; medial part of tergite anteriorly reticulate-rugose. Ovipositor 2·5 times length of tergite one, straight. Hind coxa punctate or reticulate-punctate; tarsi with long hairs the longest of which at the apices of the tarsal segments are at least twice the maximum breadth of the segment. Tarsal claws simple, very long, sickle-shaped.

Colour black, prothorax and legs testaceous.

♂. No material examined.

MATERIAL EXAMINED

3 ♀. Holotype ♀, **Finland**: Valamo, Ladoga, NE. of monastery Hainwald 24.viii.1935 (*Kerrich*) (BMNH). Paratypes. **Germany (West)**: 1 ♀, Bavaria, Schliersee, 28.vii.1958 (*Townes*) (CNC, Ottawa). **Ireland**: 1 ♀, Co. Wicklow, Deputy's Pass, 7.viii.1932 (*Stelfox*) (USNM, Washington).

HOSTS. No reared material examined.

REMARKS. This species is extremely close to *brevicauda*. The main differences between them are those cited in the key to species; the hairs of the hind tarsi also differ, those of *brevicauda* being much shorter, the longest hairs at most equal in length to the maximum breadth of the tarsi.

Meteorus ictericus (Nees von Esenbeck)

(Figs 52, 53)

Bracon icterícus Nees von Esenbeck, 1811: 22. Syntype(s) ♀, GERMANY (destroyed).

Ichneumon minutor Thunberg, 1822: 266. Holotype ♀ (UDE, Uppsala) [examined]. [Synonymized by Roman, 1912: 267.]

Zele ephippium Curtis, 1832: folio 415. Syntypes, GREAT BRITAIN: 'Coomb Wood' (NMV, Melbourne) [not examined]. [Synonymized by Curtis, 1837.]

Perilitus xanthomelas Wesmael, 1835: 29. LECTOTYPE ♂, BELGIUM: Brussels (IRSNB, Brussels), here designated [examined]. [Synonymized by Fischer, 1970*b*: 263.]

Meteorus confinis Ruthe, 1862: 18. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined]. **Syn. n.**

Meteorus fallax Ruthe, 1862: 18. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined]. **Syn. n.**

Meteorus pleuralis Ruthe, 1862: 19. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined]. **Syn. n.**

Meteorus liquis Ruthe, 1862: 20. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined]. **Syn. n.**

Meteorus consors Ruthe, 1862: 44. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined]. [Synonymized by Fischer, 1970*b*: 263.]

Meteorus crassicrus Thomson, 1895: 2154. LECTOTYPE ♀, SWEDEN: Skåne, Arrie (ZI, Lund), here designated [examined]. **Syn. n.**

Meteorus lophyriphagus Fahringer *in* Schönwiese, 1934: 495. Holotype ♀, AUSTRIA (IFF, Vienna) [examined]. **Syn. n.**

Meteorus adoxophyesi Minamikawa, 1954: 41. Holotype ♀, JAPAN: Kanaya Shizuoka-ken, 10.iv.1948 (*Sonan*) (NIAS, Yatabe) [examined]. **Syn. n.**

There is one specimen standing above the label 'minutor' in Thunberg's collection. It is in a reasonably good state of preservation and is clearly within the limits of variation of *ictericus*. The specimen is labelled 'Meteorus minutor Thbg.' in Roman's handwriting.

I have based my interpretation of *ephippium* Curtis on a specimen labelled 'Met. (Zele) ephippium C. com. w. type' by G. E. J. Nixon who examined the Curtis collection in 1948. Nixon chose a 'type-specimen' for *ephippium* but never validated his selection by publication.

Wesmael stated that he had two males of *xanthomelas*. One male and one female presently stand in his collection above this name, both of them labelled 'Perilitus xanthomelas mihi' in Wesmael's handwriting. The female clearly cannot be part of the syntype-series and I have therefore chosen the male as lectotype.

Ruthe stated that he possessed two females of *confinis*; these are present in the collection of the BMNH. I have selected as lectotype the specimen bearing Ruthe's label 'P. confinis m.'.

Ruthe stated also that he possessed two females of *fallax*, these are present in the collection of the BMNH and I have selected as lectotype the specimen bearing a label 'P. fallax m.' in Ruthe's handwriting.

Ruthe did not state what material he had of *pleuralis* or of *liquis*. There is one specimen of each of these species in the BMNH, each bearing a label in Ruthe's handwriting; I have designated these specimens as lectotypes of their respective species.

There are four conspecific specimens standing above the name 'consors' in Ruthe's collection. I have selected as lectotype the specimen which bears a label 'P. consors m.' in Ruthe's handwriting.

Four conspecific female specimens stand above the name 'crassicrus' in Thomson's collection. Two of them bear a label 'ar' [=Arrie i Skåne, one of the published localities]; one of these specimens also bears a label 'crassicrus' in Thomson's handwriting. I have chosen the latter specimen as lectotype of *crassicrus* and the second specimen from Arrie, labelled paratype by Fischer, as paralectotype.

Fahringer stated that he possessed one female of *lophyriphagus*. This specimen, a photograph of which appears in Schönwiese (1934: 496), stands in the collection of the Universität für Bodenkultur, Vienna. It bears a label 'Meteorus lophyriphagus n. sp. Type' in Fahringer's handwriting and a second label 'Rinkenberg K., 25.7.32, ex Loph. sif.'. It is well within the limits of variation of *icterícus*.

Minamikawa, in his description of *adoxophyesi*, stated that tergite one was about three times as long as apically broad and that the tracheal grooves [dorsal pits] were obsolete. These points in the description certainly do not agree with what is to be observed on the holotype in which tergite one is twice as long as apically broad and dorsal pits are present. Thus *adoxophyesi* comes within the limits of variation of *ictericus*. Minamikawa formerly used the name Sonan under which name he cited himself as the author of *Meteorus adoxophyesi* (1954: 43). Since the paper in which this species was described appeared under the authorship of Minamikawa I have used this name in citing authorship of *adoxophyesi*, as did Shenefelt (1969: 50).

♀. Antennae 26- to 33-segmented, long, all segments at least slightly longer than broad. Head strongly contracted behind the eyes (Fig. 53), generally not strongly rounded; length of eyes 2·5–3·0 times length of temple in dorsal view. Ocelli large, OO = 1·0–1·5 times OD, protuberant, the ocellar area distinctly raised. Eyes large, protuberant inner margins converging (Fig. 52) but never strongly so. Malar space short, at most equal to half basal breadth of mandible. Face not strongly protuberant but often slightly raised medially, polished, finely punctate. Clypeus narrower than face, protuberant, polished, sparsely punctate, the ventral border often broadly and shallowly emarginate. Tentorial pits small, indistinct. Mandibles moderately twisted, short but fairly stout. Pronotum laterally smooth, punctate. Notaulices deeply impressed, foveolate. Sternaulices foveolate, narrow, often at least partly obsolescent; rest of mesopleuron polished, finely punctate. Propodeal carinae weakly developed except for the medial transverse carina which is strongly raised, at least centrally; propodeum dorsally polished with a few obsolescent rugae between the carinae, the rugose sculpture sometimes rather stronger and occasionally reticulate-rugose though never strongly so. Tergite one long, slender with distinct dorsal pits and glymmae; dorsal surface striate. Ovipositor long, 2·5–3·0 times length of tergite one, stout, usually slightly down-curved at the apex. Legs long, slender; hind coxa polished and with fine puncturation, often reticulate-punctate ventrolaterally but never with distinct rugosity; hind tibia swollen, particularly in its apical half but not usually as broad as the femur; tarsal claws strongly bent and with a large basal lobe. Recurrent always antefurcal, usually markedly so but occasionally almost interstitial.

Colour black except head, prothorax, legs and pterostigma which are yellow, tergite two is often also yellow or at least lighter in colour than rest of gaster; head always yellow except sometimes for a dark patch on vertex around ocelli and occasionally extending back to the occipital carina, legs also generally yellow except that the apex of hind tibia and of the tarsal segments are infuscated. I have seen only one specimen of this species in which the head was almost completely dark and in this specimen the legs were also rather dark. Lighter-coloured specimens are not infrequent in occurrence; the thorax and gaster either in whole or in part may be reddish testaceous rather than black. Rarely specimens are found which are wholly reddish testaceous except for the ovipositor sheaths which are black.

♂. Same as ♀ except antennae longer.

MATERIAL EXAMINED

655 ♀, 14 ♂. **Austria, Czechoslovakia, Finland, France, Germany, Great Britain, Hungary, Ireland, Japan, Netherlands, Sweden, Turkey.**

HOSTS. *Archips podana* (Scopoli), *Epiphyas postvittana* (Walker), *Adoxophyes orana* (Fischer von Röslerstamm), *Adoxophyes privitana* (Walker), *Tortrix viridana* (L.), *Croesia bergmanniana* (L.), *Acleris hastiana* (L.), *Epinotia sordidana* (Hübner) (Lepidoptera: Tortricidae). *Neodiprion sertifer* (Geoffroy in Fourcroy) (Hymenoptera: Diprionidae).

REMARKS. *Meteorus ictericus* is a rather slender, conspicuously smooth species; it is rather similar in appearance to *obsoletus* from which it is easily distinguished by its possession of dorsal pits on tergite one.

I am by no means confident that I have adequately defined the specific limits of *ictericus* and of *pallipes*. The typical forms of the two species are fairly easily differentiated but small specimens quite frequently occur which are difficult to place. It may be that *ictericus* and *pallipes* as I have defined them comprise a complex of species which I am at present unable to separate, or there may only be a single large protean species. I am retaining them here as two distinct but closely related species. I have given *ictericus* rather broader limits than *pallipes* which I have restricted to the typical form. Included in the synonymy of *ictericus* are *confinis, fallax, pleuralis, liquis* and *crassicrus* although they are all smaller and lighter in colour than typical *ictericus*. Ruthe gave his four nominal taxa specific rank on the basis of their differences in colour from typical *ictericus* and on their shorter antennae. Colour differences are not a reliable basis for specific distinction and the differences in the antennae are only such as are to be expected in small specimens. Thomson differentiated *crassicrus* principally by its possession of a swollen hind tibia. In Thomson's original material, however, the hind tibia is not more swollen than in other specimens of *ictericus*. Although *crassicrus* is rather smaller and paler than typical specimens of *ictericus* it is otherwise within the limits of variation of that species.

Meteorus jaculator (Haliday)

(Fig. 15)

Perilitus (*Meteorus*) *jaculator* Haliday, 1835: 34. Syntypes ♀, IRELAND (lost).

Meteorus obscurellus Ruthe, 1862: 29. Holotype ♀, GERMANY: Ruthe coll. (BMNH) [examined]. [Synonymized by Marshall, 1887: 108.]

Meteorus tenuicornis Thomson, 1895: 2164. LECTOTYPE ♀, SWEDEN: Skåne, Palsjo (ZI, Lund), here designated [examined]. **Syn. n.**

There is no specimen of this species present in Haliday's collection; I have therefore based my interpretation of *jaculator* on specimens from Stelfox's comprehensive collection of Irish insects which Stelfox himself had named as *jaculator*. These specimens fit Haliday's description and I believe Stelfox's interpretation to be correct. There is one specimen of *obscurellus* in the BMNH collection; this specimen bears a label in Ruthe's handwriting 'P. obscurellus M.' and corresponds exactly with the description of that species. It is clearly conspecific with the insects I have interpreted as *jaculator*. There is one female specimen standing above the name *tenuicornis* in Thomson's collection, it is from the type-locality and agrees with Thomson's description of the species. This specimen has been labelled 'type' by Fischer; there is a second (male) specimen taken at Mölle.

♀. Antennae short, 18- to 26-segmented, slender, all segments of flagellum at least as long as broad. Head swollen behind eyes; temples longer than eyes (Fig. 15). Ocelli small, OO = 3–4 times OD. Eyes small, height of eye less than breadth of face; slightly convergent. Malar space at least slightly shorter than basal breadth of mandible. Face about twice as broad as high, protuberant, reticulate-punctate with some rugosity medially, occasionally entirely smooth and shining with minute punctures. Clypeus smooth, shining, with scattered large punctures, not strongly protuberant. Tentorial pits small but distinct. Mandibles stout, not strongly twisted. Pronotum projecting in front of mesonotum; laterally smooth and weakly rugose. Notaulices thin, foveolate. Sternaulus narrow, reticulate-foveolate with a few scattered rugae; rest of mesopleurae smooth, minutely punctured except for a large reticulate-foveolate area beneath the base of the forewing. Propodeum weakly rugose, the carinae weak but generally distinct, occasionally the rugosity is strong enough to obscure the carinae. Tergite one generally predominantly irregular reticulate-rugose with only a few striae laterally, occasionally the striae are predominant but usually then they are obsolescent; the medial longitudinal area of the tergite is strongly raised. Ovipositor 3–4 times length of tergite one. Hind coxa generally strongly rugose, occasionally weakly so. Tarsal claws short with no basal lobe.

Colour black; legs testaceous but sometimes the coxae darker; clypeus and mandibles often yellow.

♂. Same as ♀ except that the antennae much longer, up to 29-segmented, all flagellar segments conspicuously longer than broad.

MATERIAL EXAMINED

42 ♀, 1 ♂. **Bulgaria**: 1 ♀, Rhodopi, 23.viii.1977 (*Zaykov*) (ZC, Plovdiv). **Germany (West)**: 1 ♀, Hiedeck, Heidelb. (*Haeselbarth*) (EH, Munich). **Great Britain**: 12 ♀, England, Northamptonshire, Spratton, viii.-ix.1975 (*Gauld*) (BMNH); 1 ♀, E., Hertfordshire, Tring, 8.vi.1936 (*Benson*) (BMNH); 1 ♀, E., H., Bricket

Wood, 28.v.1937 (*Nixon*) (BMNH); 1 ♀, E., Cambridgeshire, Woodwalton, 21–23.v.1949 (*Benson*) (BMNH); 1 ♀, E., Dorset, Studland Heath, 6.vi.1938 (*Benson*) (BMNH); 1 ♀, E., Kent, Eynsford, 6.vi.1939 (*Nixon*) (BMNH); 1 ♀, E., Hereford and Worcester, Fownhope, Capler Wood, 31.v.1936 (*Perkins*) (BMNH); 1 ♀, E., H. and W., Fownhope, Pagets Wood, 1.vi.1936 (*Perkins*) (BMNH); 1 ♀, E., Devon, Torquay, 19.vi.1960 (*Vockeroth*) (CNC, Ottawa). **Ireland**: 1 ♂, Co. Dublin, B'Scorney, 15.vii.1945 (*Stelfox*) (USNM, Washington); 2 ♀, Co. Down, Tollymore Park, 27.viii.1961 and 17.ix.1961 (*Stelfox*) (USNM, Washington); 2 ♀, Co. Do., Dramahilly, 20. and 27.vii.1964 (*Stelfox*) (USNM, Washington); 1 ♀, Co. Do., Donnaird Lo., 17.x.1965 (*Stelfox*) (USNM, Washington); 5 ♀, Co. Sligo, Trawallua, 24–29.vi.1933 (*Nixon*) (BMNH). **Netherlands**: 2 ♀, Waarder, Oosteinde, vii. and ix.1974 (*van Achterberg*) (RNH, Leiden); 2 ♀, Wijster (Dr.) vi.-vii.1973 and vii.1977 (*van Achterberg*) (RNH, Leiden); 1 ♀, Oostvoorne, 15–20.v.1973 (*Van Achterberg*) (RNH, Leiden); 1 ♀, Meyendal near the Hague, Bierlap outer dunes, 18–25.vii.1974 (*van der Zon*) (RNH, Leiden); 1 ♀, Ede, 22–28.ix. (*van Rossem*) (RNH, Leiden); 1 ♀, Nunspeet, 1.x.1975 (*Zwackals*) (RNH, Leiden); 1 ♀, Wassenaar, 18.vii.1971 (*Pronk*) (RNH, Leiden). **Sweden**: 1 ♀, Upl., Vallentuna, 17.ix.1941 (*Hedqvist*) (HC, Stockholm).

HOSTS. No reared material examined. Van Burgst (1919: 105) recorded *jaculator* as a parasite of *Trichophaga tapetzella* L. (Lepidoptera: Tineidae). I have examined these specimens and found them to be *M. cespitator*.

Meteorus lionotus Thomson

(Figs 30, 31, 38, 40)

Meteorus lionotus Thomson, 1895: 2160. LECTOTYPE ♂, SWEDEN: Norland (ZI, Lund), here designated [examined].

Meteorus ruficoloratus Fischer, 1957*b*: 4. Holotype ♂, GERMANY (WEST): München, 15.vii.1884 (*Kriechbaumer*) (ZSBS, Munich) [examined]. **Syn. n.**

There are two specimens standing above the name *lionotus* in Thomson's collection. I have selected as lectotype a specimen labelled 'Norl.' (the type locality) in Thomson's handwriting; this specimen agrees precisely with the description of *lionotus*. The second specimen has evidently been misplaced and has no connection with *lionotus*.

I consider Fischer's placement of *ruficoloratus* near *ictericus* to be erroneous despite their common possession of short, strongly contracted temples. The holotype of *ruficoloratus* has only spurious pits on the dorsal surface of tergite one and the ventral borders of this tergite conjoined beneath at about the mid-point of the segment, and comes well within the limits of variation of *lionotus*.

♀. Antennae 31- to 33-segmented, long, most segments at least twice as long as broad. Head strongly contracted behind the eyes and the temples short, about one-third length of eye (Fig. 31). Ocelli very large, OO = 0·5 times OD, protuberant. Eyes a little broader than high, not strongly protuberant. Clypeus strongly protuberant. Mandibles strongly twisted, small, rather delicate. Thorax large, a little higher than long. Mesonotum smooth, weakly rugose-punctate; notaulices weak, indistinct anteriorly. Sternaulus shallow, rugose, the sculpture often obsolete anteriorly and posteriorly; rest of mesopleurae polished, punctate. Propodeum generally depressed, usually with distinct carinae laterally and occasionally with a weak medial transverse carina; usually smooth, polished anteriorly but in some specimens this area is weakly rugose. Tergite one long with no dorsal pits; ventral borders conjoined at about mid point of segment; dorsal surface smooth at base and longitudinally striate apically though this is sometimes obsolescent. Ovipositor about 1·5 times length of tergite one. Legs long, slender; tarsal claws with strong basal lobe. Wings large, first abscissa of cu_1 longer than *cua*.

Colour testaceous, usually vertex around ocelli and occipital region black; sometimes propodeum, first tergite and apex of gaster dark, occasionally the whole body dark except for the legs which are always light in colour.

♂. Same as ♀ except that ocelli and eyes slightly smaller.

MATERIAL EXAMINED

30 ♀, 22 ♂. **Great Britain, Greece, Sweden.**

HOSTS. *Thera variata* (Denis & Schiffermüller), *Thera obeliscata* (Hübner) (Lepidoptera: Geometridae) on *Pinus* and *Thera juniperata* (L.) on *Juniperus*. In Great Britain the parasite has two generations in April/May and in September.

REMARKS. The extremely large ocelli and the short strongly contracted temples immediately distinguish *lionotus* from any closely related species. The shape of the thorax and the weakness of the sculpture are also characteristic of *lionotus*.

Meteorus longicaudis (Ratzeburg)

(Fig. 18)

Perilitus longicaudis Ratzeburg, 1848: 55. Syntypes ♀, GERMANY (destroyed).

I have followed Thomson's (1895) interpretation of this species which was based on specimens reared from the same host species as Ratzeburg's original material. The description of *longicaudis*, although short, is sufficient for the species to be identified with tolerable certainty.

♀. Antennae 29- to 32-segmented, flagellar segments all clearly longer than broad, flagellum gradually tapering to apex. Head broad, strongly rounded behind eyes. Ocelli small, OO = 3 times OD. Eyes rather small, barely convergent. Malar space about equal to basal breadth of mandible. Face not strongly protuberant, about twice as broad as high, strongly punctate and, at least centrally, reticulate-punctate; vertex also punctate but frons centrally polished, impunctate. Clypeus moderately convex with scattered deep punctures and a broad polished reflexed border. Tentorial pits indistinct. Mandibles stout, slightly twisted. Pronotum rugose in its ventral half, polished dorsolaterally. Notaulices narrow but deeply impressed foveolate furrows. Sternaulus rugose, always broadened anteriorly into a reticulate-rugose area; rest of mesopleurae densely punctate and, dorsally, with a rugose area beneath the wing. Propodeum strongly rugose, the carinae strong but not easily seen. Tergite one very broad, length about 1·5 times apical breadth; dorsal pits large, distinct; dorsal surface finely striate laterally finely rugose medially. Ovipositor very long, 4–5 times length of tergite one. Legs long, hind coxa weakly rugose dorsally; tarsal claws simple but somewhat thickened at base, strongly curved.

Colour black; antennae, head, prothorax and legs orange-testaceous; the basal half of hind tibia lighter yellow, almost ivory; the head is sometimes infuscated, at least in part, and tergite two is often lighter in colour than rest of body.

♂. Same as ♀ except antennae longer, up to 36-segmented, all segments at least twice as long as broad; propodeum smaller; tergite one narrower.

MATERIAL EXAMINED

27 ♀, 4 ♂. **Netherlands**: 4 ♀, Well, 1978 (*Lefeber*) (RNH, Leiden); 1 ♀, Brisen Dantz (RNH, Leiden). **Sweden**: 5 ♀, Thomson coll. (ZI, Lund); 16 ♀, 4 ♂, SM. Hornsö, 28.v.–21.vi.1954 (*Lundblad*) (5 ♀ in BMNH, rest in NR, Stockholm); 1 ♀, Sk. His väderö, 29.iv.1973, ex *Eledenoprius armatus* Panzer (*Huggert*) (HC, Stockholm).

HOSTS. Type-material reared from *Orchesia micans* (Panzer) (Coleoptera: Melandryidae). Thomson's specimens of *longicaudis* which I have examined were reared from the same host-species. I have also examined a specimen reared from *Eledenoprius armatus* Panzer (Coleoptera: Tenebrionidae). The larvae of both these species of beetle live in bracket fungi on trees.

REMARKS. *M. longicaudis* most closely resembles *obfuscatus*, which also parasitizes *Orchesia micans*; *longicaudis* is easily distinguished from *obfuscatus* by its much longer ovipositor, rugose sternaulus and longer antennae. The males of the two species are more difficult to distinguish since the antennae of both are long and of course they lack ovipositors; the sculpture of the sternaulus is the principal means of separating them. *M. longicaudis* males generally also have slightly smaller eyes and ocelli and rugose hind coxae, the latter are smooth, punctate in *obfuscatus*. *M. longicaudis* also resembles *salicorniae* from which it may be distinguished by its longer ovipositor, by the shape of its head and by its strong facial puncturation.

Meteorus melanostictus Capron

(Fig. 57)

Meteorus melanostictus Capron *in* Marshall 1887: 115. Syntypes ♀, GREAT BRITAIN (lost).

Meteorus niger Lyle, 1913: 244. LECTOTYPE ♀, GREAT BRITAIN: England, Hampshire, New Forest, 13.v.1911 (*Lyle*), *H. syringaria* (BMNH), here designated [examined]. **Syn. n.**

I have been unable to locate any of Capron's specimens of *melanostictus*, I have therefore based my interpretation of this species on a female standing above the name *melanostictus* in Marshall's collection. This specimen agrees precisely with Capron's description. There are two males also from Marshall's collection placed with the female, one of them bearing a label 'melanostictus Capron' in Marshall's handwriting. These males are not conspecific with the female and I consider them to be melanic specimens of *M. gyrator*. These specimens do agree with Marshall's statements on what he evidently mistakenly considered to be the male of *melanostictus*. Lyle had completely the wrong concept of *melanostictus*, the specimens from his collection named as that species are *lionotus* and his description and host records for *melanostictus* also apply to *lionotus*. Lyle (1913) then described specimens of the true *melanostictus* as a new species, *niger*. There are four specimens (2 ♂, 2 ♀) of *niger* in Lyle's collection labelled 'type' by Lyle; I have selected the best-preserved female as lectotype.

♀. Antennae 25- to 26-segmented, all flagellar segments at least twice as long as broad. Head strongly contracted behind eyes, rather flat between ocelli and occipital carina; eyes in dorsal view about twice as long as temples; frons with a blunt tubercle medially, in front of the fore ocellus. Ocelli large, OO = 1·0–1·5 times OD. Eyes large, protuberant, moderately convergent. Malar space short, distinctly less than half the basal breadth of mandible. Face about as wide as high, not strongly protuberant, smooth, punctate, with some weak rugosity. Clypeus strongly protuberant with scattered large punctures. Tentorial pits deep. Mandibles strongly twisted. Pronotum projecting but little in front of the mesonotum, laterally smooth with a little rugosity medially. Notaulices thin, foveolate, coalescing posteriorly into a rugose area. Sternaulus thin, foveolate, often obsolete posteriorly; rest of mesopleurae smooth, punctate; subalar prominence strongly raised, carinate. Propodeum short, without distinct carinae except for a strongly raised medial transverse carina which divides the propodeum into dorsal and posterior faces, the sculpture rugose, generally weak and never reticulate. Tergite one rather stout with distinct dorsal pits and large glymmae; ventral borders of tergite widely separated; dorsal surface coarsely striate. Ovipositor short, about 1·5 times length of tergite one. Legs short; hind coxa smooth, punctate; tarsal claws with a distinct basal lobe.

Colour black; face, clypeus, orbits, genae, prothorax, tegulae and legs yellow.

♂. Same as female except for differences in terminalia.

MATERIAL EXAMINED

21 ♀, 6 ♂. **Great Britain**: 20 ♀, 6 ♂, England, Hampshire, New Forest (*Lyle*), ex *H. syringaria* (BMNH); 1 ♀, Marshall coll. (BMNH).

HOSTS. *Apeira syringaria* (L.), *Ennomos quercinaria* (Hufnagel) (Lepidoptera: Geometridae).

Meteorus micropterus (Haliday)

(Fig. 1)

Perilitus (*Meteorus*) *micropterus* Haliday, 1835: 27. LECTOTYPE ♀, IRELAND: 'British, Haliday, 20.2.82' (NMI, Dublin), here designated [examined].

I have chosen and labelled as lectotype the specimen selected as '♀ type' by Stelfox in 1948 (unpublished Ms). The specimen is glued on a rectangular piece of card and it is by far the best-preserved specimen of Haliday's material of this species. It agrees precisely with Haliday's description though it is rather faded in colour.

♀. Antennae 23- to 26-segmented, short, thick; segments obconical and except for the first four flagellar segments only as long as broad; only first segment of flagellum as much as twice as long as broad. Head with temples strongly rounded, rather square in face view. Ocelli small, OO = 3 times OD. Eyes small, inner orbits parallel; length of malar space at least equal to basal breadth of mandible. Face protuberant, punctate, projecting in front of frons which is depressed. Clypeus broad, smooth, punctured, distinctly divided from the face. Tentorial pits large, deep. Mandibles moderately twisted, large, stout. Pronotum slightly expanded, projecting strongly in front of and to the sides of the mesonotum, forming a 'collar'. Mesonotum rather narrow, closely punctate and very hairy. Mesopleurae mostly smooth with scattered punctures. Sternaulus foveolate. Propodeum reticulate-rugose, without distinct carinae. Tergite one smooth, shining, with obsolescent longitudinal striate sculpture posterolaterally; ventral borders fused beneath for at least the proximal half of the segment. Ovipositor twice length of tergite one, straight. Legs stout; hind coxae rugose dorsally; tarsal claws without a lobe but strongly swollen at base. Wings short, narrow, usually infumate.

Colour brownish black; legs testaceous, most usually with the hind coxa dark and frequently also the hind femur, often tergite two, sometimes side of pronotum and occasionally base of flagellum lighter in colour.

♂. Same as the ♀ except that eyes smaller; antennae 24- to 28-segmented, the segments longer, the flagellum distinctly thickened in its proximal half and gradually tapering to apex and the colour darker; mid and hind coxae usually darker, sometimes black, this colour change may also affect the rest of the mid and hind legs so that occasionally the mid and hind legs are almost completely black, only the tarsi retaining a lighter tinge.

MATERIAL EXAMINED

38 ♀, 46 ♂. **Germany, Great Britain, Ireland.**

HOSTS. *Hepialus humuli* (L.), *Hepialus fusconebulosa* (De Geer) (Lepidoptera: Hepialidae). This species evidently uses as hosts larvae living at the base of dense herbage such as grass tussocks. This correlates with the sturdy build and shortened appendages of the parasite which will enable it the better to push its way into suitable host-habitats.

REMARKS. *M. micropterus* bears a superficial resemblance to *abdominator* and to *consimilis*. They all are dark, heavily sculptured insects with short dark wings and short thick legs and antennae. Both *abdominator* and *consimilis*, however, have dorsal pits in tergite one, the ventral borders of which are widely separated, in addition *consimilis* has larger ocelli, strongly twisted mandibles and a long malar space, and *abdominator* a down-curved ovipositor and a broad reticulate-rugose sternaulus.

Meteorus nixoni sp. n.

(Figs 8, 12)

♀. Antennae 43-segmented, long, all segments at least longer than broad. Head broad, contracted behind eyes but not strongly so; temples shorter than eyes. Ocelli small, OO = 2·5 times OD. Eyes small, protuberant, very slightly convergent. Malar space slightly shorter than basal breadth of mandible. Face about twice as broad as high, not strongly protuberant, centrally reticulate-rugose, laterally reticulate-punctate. Clypeus broad, only slightly narrower than face, not strongly protuberant but deeply impressed at the junction with face and with a strongly reflexed apical margin, shining, sparsely punctured; clypeal hair conspicuously longer than facial hair. Tentorial pits deep. Mandibles large, not twisted, with conspicuous reticulate-foveolate sculpture on basal half. Pronotum strongly rugose. Mesonotum rather narrow, densely almost reticulately punctate, especially on the central lobe; notaulices thin, deeply impressed. Sternaulus reticulate-rugose; rest of mesopleurae polished, punctate except for a subalar patch of rugosity. Propodeum with basal and medial transverse carinae and a central longitudinal carina, with rugose sculpture between. Tergite one rather broad at base, apically only 2·5 times as broad as at narrowest point, the spiracles distinctly before mid-point; dorsal pits large, deep, behind dorsal pits strongly longitudinally strigose. Tergite two with distinct thyridia and a trace of longitudinal strigose sculpture. Ovipositor long, about 4 times length of tergite one. Legs long; hind coxa shining, punctured but not densely so; hind femur densely reticulate-punctate; hind tibia swollen, though not as broad as femur, and narrow at base; tarsal claws thick, strongly curved and strongly swollen at base, almost with a basal lobe. Wings large infumate.

Colour piceous; mandibles, palps, fore and mid legs testaceous, hind coxa and femur brown, tibia black except at the base which is light yellow, hind tarsi black except at base and apex which are light yellow; malar space and clypeus slightly lighter in colour than rest of head.

♂. Unknown.

MATERIAL EXAMINED

Holotype ♀, **Austria**: Tyrol, Oberau, vii.1938 (*Nixon*) (BMNH).

HOSTS. No reared material examined.

REMARKS. The characteristics of tergite one proclaim the close relationship of *nixoni* with *corax* and *sulcatus*. Although the sculpture on tergite two, which is strongly developed in the two latter species, is largely obsolete in *nixoni*, traces of it are discernible and thyridia are well developed in all three species. The characters given in the key to species serve amply to distinguish the three species.

I name this species after Dr G. E. J. Nixon in appreciation of his contribution to the understanding of Hymenoptera.

Meteorus obfuscatus (Nees von Esenbeck)

(Fig. 22)

Bracon obfuscatus Nees von Esenbeck, 1811: 22. Syntypes, GERMANY (destroyed).
Zele thoracicus Curtis, 1832: folio 415. Syntypes, GREAT BRITAIN: England, Regent's Park (NMV, Melbourne) [not examined]. [Synonymized by Haliday, 1835: 31.]
Perilitus formosus Wesmael, 1835: 36. LECTOTYPE ♀, BELGIUM: Liege, coll. Wesmael (IRSNB, Brussels), here designated [examined]. [Synonymized by Marshall, 1887: 106.]
Meteorus fodori Papp, 1973: 3. Holotype ♀, YUGOSLAVIA: Montenegro, Bjela Gora, Grahovo, 1929 (*Fodor*) (HNHM, Budapest) [examined]. **Syn. n.**

Wesmael possessed four specimens of *formosus*. Two specimens presently stand in his collection above this name; both are labelled 'Perilitus formosus mihi' in Wesmael's handwriting. The two specimens are female, are conspecific and agree with Wesmael's description of *formosus*; I have selected the better preserved of them as lectotype.

The holotype of *M. fodori* is rather smaller than the average specimens of *obfuscatus* but is within the limits of variation of that species.

♀. Antennae short, 23- to 29-segmented, the basal segments of the flagellum not more than twice as long as broad, often shorter; the segments in the apical half of the flagellum only as long as broad. Head behind eyes contracted, rounded; temples narrower than breadth of head across eyes, slightly shorter than eyes. Ocelli small, OO = 2·5 times OD. Eyes large, protuberant, slightly convergent (Fig. 22). Malar space short, not more than half basal breadth of mandible. Face about 1·5 times as broad as high, not strongly protuberant, reticulate-punctate, often weakly rugose beneath the antennal sockets, rarely almost completely rugose. Clypeus protuberant, distinctly divided from face, slightly narrower than face, polished and with scattered large punctures, sometimes with a slight medial impression in the apical border. Tentorial pits small. Mandibles stout, moderately twisted. Pronotum projecting slightly in front of mesoscutum, laterally smooth or at most weakly rugose. Notaulices narrow, foveolate; rest of mesonotum finely punctate. Sternaulus deeply impressed, foveolate, occasionally with a few rugae or foveae immediately below; rest of mesopleurae smooth, punctured except for a rugose-foveolate area beneath the base of the forewing. Propodeum with carinae distinct, occasionally smooth between but usually with more or less well-developed rugosity. Tergite one stout with distinct dorsal pits; generally somewhat raised medially with a medial longitudinal reticulate-rugose band and striae laterally; occasionally tergite one is completely striate dorsally. Ovipositor twice length of tergite one, slender, usually straight but in some specimens down-curved. Legs long, slender; hind coxa smooth punctate; tarsal claws long, without basal lobe but slightly swollen at base.

Colour brownish black, legs always yellow except occasionally the hind tibia infuscate apically; prothorax usually orange-testaceous and sometimes the antennae, head, mesothorax and gaster except for tergite one also this colour, at least partly.

♂. Same as ♀ except that antennae longer, 29- to 32-segmented, all flagellar segments much longer than broad; temple as long as eye, eyes smaller.

MATERIAL EXAMINED

41 ♀, 27 ♂. **France, Germany, Great Britain, Hungary, Sweden, Yugoslavia.**

HOSTS. The original material was reared from *Orchesia micans* (Panzer) (Coleoptera: Melandryidae); I have examined specimens reared from this same host in *Polyporus hispidus* and others recorded merely as 'ex *Polyporus*'. I have also examined two specimens 'ex cocoons made in cells of Halomerid beetles' and one specimen recorded as a parasite of ?*Scolytus triarmatus* Eggers (Coleoptera: Scolytidae).

REMARKS. *M. obfuscatus* is similar to *profligator* and to *punctifrons* but the conspicuously short antennae, the larger eyes and ocelli and the shape of the head of *obfuscatus* at once distinguish that species.

Meteorus obsoletus (Wesmael)

(Fig. 42)

Perilitus obsoletus Wesmael, 1835: 49. LECTOTYPE ♀, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels), here designated [examined].

Meteorus viridanae Johansson, 1964: 251. Holotype ♀, SWEDEN: Borgholm, 30.vi.1954, ex larva of *Tortrix viridana* (L.), coll. 13–16.vi.1954 (*Johansson*) (ZI, Lund) [examined]. **Syn. n.**

Wesmael (1835: 50) stated that he possessed two males and a female of this species; three such specimens still stand in his collection over the label 'obsoletus' and each is labelled 'Perilitus obsoletus mihi' in his handwriting. The three specimens are conspecific, are in good condition and agree precisely with Wesmael's description. The female specimen has been labelled lectotype by Fischer though he failed to mention this selection in his redescription of the species (1970*a*).

♀. Antennae 27- to 30-segmented, long, all segments at least 1·5 times as long as broad. Head rounded behind eyes. Ocelli large, OO = OD (Fig. 42). Eyes not protuberant, moderately convergent. Face moderately convex, punctate or reticulate-punctate, sometimes with a little transverse rugosity close beneath the antennal sockets. Clypeus not strongly protuberant. Tentorial pits small, shallow. Mandibles small, strongly twisted. Notaulices shallow rugose grooves. Sternaulus reticulate-rugose, sometimes obsolete anteriorly; rest of mesopleurae smooth, punctate except for a subalar patch of rugosity. Propodeum evenly rounded with only a weak medial impression posteriorly, irregularly reticulate-rugose. Tergite one slender, finely longitudinally striate dorsally, laterally rather smooth at least at the base, without dorsal pits, ventral borders of tergite joined from base of segment to about mid-point; spiracles slightly behind middle of segment. Ovipositor 2·0–2·5 times length of tergite one, straight, slender with no strong preapical constriction. Hind coxa smooth, punctate without strong rugose sculpture, tarsal claws with strong basal lobe.

Colour brownish black; head, prothorax and legs testaceous, mesothorax and gaster also sometimes testaceous; tergite one always dark except occasionally at the base.

♂. Same as ♀ except eyes and ocelli smaller, eyes slightly less convergent and antennal segments slightly longer.

MATERIAL EXAMINED

30 ♀, 21 ♂. **Austria**: 3 ♀, Partschins, Südtirol, 1050 m, 31.viii. 1967 (*Haeselbarth*) (EH, Munich). **Belgium**: 2♂, Wesmael coll. (paralectotypes of *Perilitus obsoletus* Wesmael) (IRSNB, Brussels). **France**: 1 ♂, Arles sur Tech, 14.vi.1961 (*Clark*) (BMNH); 3 ♀, 3 ♂, Vaucluse, Mont Ventoux, 1978, ex *Tortix viridana* (L.) (*du Merle*) (BMNH). **Germany (West)**: 8 ♀, 7 ♂, Geierlambach, Heidelbeere, vii.–viii.1970 (*Haeselbarth*) (EH, Munich); 1 ♂, 'Oberbiberg bei München, an Heidelbeere', 15.vii.1970 (*Haeselbarth*) (EH, Munich). **Great Britain**: 1 ♀, 1 ♂, England, Gloucestershire, 1932, ex *Tortrix viridana* (L.) (*Brown*) (BMNH); 1 ♀, E., Hertfordshire, Whetstone, 9.vii.1961 (Ward) (BMNH); 3 ♀, 4 ♂, E., Berkshire, Wytham (*Varley*) (UM, Oxford); 1 ♀, E., Hampshire, New Forest, 21.vi.1906, ex *Tortrix viridana* (L.) (*Lyle*) (BMNH). **Ireland**: 1 ♂, Co. Sligo, Trawallua, 24–27.vii.1933 (*Nixon*) (BMNH); 27.vii.1933 (*Stelfox*) (USNM, Washington). **Netherlands**: 1 ♂, Waarder (ZH) Oosteinde, 10–11.viii.1971 (*van Achterberg*) (RNH, Leiden). **Sweden**: 3 ♀, Borgholm, 30.vi.1954, ex *Tortrix viridana* (L.) (*Johansson*) (paratypes of *Meteorus viridanae* Johansson) (ZI, Lund); 2 ♀, Röstanga. 4–6.vii.1938 (*Perkins*) (BMNH); 2 ♀, Höör district, 11–13.vii.1938 (*Perkins*) (BMNH). **Turkey**: 1 ♀, 1 ♂, Bulancek, vi.1974, ex *Gypsonoma dealbana* (Frölich) (BMNH).

HOSTS. *Tortrix viridana* (L.), *Gypsonoma dealbana* (Frölich) (Lepidoptera: Tortricidae), larvae feeding on oak between spun leaves or shoots.

REMARKS. This species is superficially similar to *cinctellus* but the closure of tergite one, the larger ocelli and the moderate convergence of the eyes at once distinguish *obsoletus*.

Meteorus oculatus Ruthe

(Figs 5, 6)

Meteorus oculatus Ruthe, 1862: 23. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined].

Meteorus pachypus Schmiedeknecht, 1897: 207. LECTOTYPE ♀, GERMANY: coll. Schmiedeknecht (MNHU, Berlin), here designated [examined]. **Syn. n.**

I have examined three conspecific specimens labelled 'Meteorus pachypus Schmied' in Schmiedeknecht's handwriting (♀♂ MNHU, Berlin', ♀ AU, Wageningen). The two females agree precisely with the description of *pachypus* and I regard them as syntypes of that species. The male sex is not mentioned in the original description and the male specimen is very possibly a subsequent capture and is therefore excluded from consideration as a syntype. The specimen in Wageningen is part of the collection of van Burgst who is known to have bought material from Schmiedeknecht, probably around 1910–1915 (Zwart, *in litt.*).

♀. Antennae 30- to 33-segmented, rather slender, in apical half of flagellum segments only slightly longer than broad. Head broad, strongly contracted behind eyes; eye about 3 times length of temple in dorsal view. Ocelli small, OO about 2·5 times OD. Eyes very large, protuberant, strongly convergent. Malar space very short, much less than half the basal breadth of a mandible. Face about as broad as high, weakly convex, densely punctate with some rugosity medially. Clypeus not strongly protuberant, smooth with scattered punctures. Tentorial pits large. Mandibles slightly twisted. Prothorax stout, expanded forwards and sideways, rather smooth laterally but weakly rugose in part. Mesothorax rather small, its breadth across the tegulae distinctly less than breadth of head; notaulices deep, foveolate. Sternaulus deep, reticulate-rugose; rest of mesopleurae smooth, punctate except dorsally rugose-foveolate. Propodeum rather narrow, strongly rugose with indistinct carinae, the medial transverse carina, at the junction of the dorsal and posterior faces of the propodeum, the most distinct. Tergite one long, slender; dorsal pits small but distinct, dorsal surface of tergite longitudinally striate with a scalariform element medially. Ovipositor long, about 3 times length of tergite one, straight. Outer face of hind coxa reticulate-punctate; hind tibia strongly swollen, about as thick as femur, constricted at base. Tarsal claws simple, short, thick and strongly expanded at base.

Colour black, legs testaceous; antennae, clypeus, mandibles, pronotum ventrally and tergite two also sometimes lighter in colour; wings infumate.

♂. Same as ♀ except that eyes are less strongly convergent and hind tibia not strongly swollen.

MATERIAL EXAMINED

7 ♀, 1 ♂. **Germany (West)**: 1 ♀, Ruthe coll. (BMNH); 1 ♀, 'Oberberg b, München, an Heidelbeere', 2.vii.1969 (*Haeselbarth*) (EH, Munich); 1 ♀, Geierlambach, Heidelbeere (*Haeselbarth*) (EH, Munich); 1 ♀, coll. Schmiedeknecht (AU, Wageningen) (paralectotype of *Meteorus pachypus* Schmiedeknecht); 1 ♂, coll. Schmiedeknecht (MNHU, Berlin). **Hungary**: 1 ♀, Budapest, 1926 (*Biro*) (HNHM, Budapest). **Sweden**: 1 ♀, SM. Alem, Strömsrum, 1958 (*Sundholm*) (ZI, Lund); 1 ♀, Sö., Dalarö Malmen, viii.1976 (*Quinlan & Huddleston*) (BMNH).

HOSTS. No reared material examined.

REMARKS. *M. oculatus* is superficially similar to *graciliventris*, both having very large, convergent eyes, short temples and long ovipositors. *M. graciliventris*, however, has much larger ocelli, small but distinct lobes on the tarsal claws, and temples which are shorter and more strongly contracted than those of *oculatus*; in addition *oculatus* has a strongly swollen hind tibia which is lacking in *graciliventris*.

Meteorus pallipes (Wesmael)

(Figs 50, 51)

Perilitus pallipes Wesmael, 1835: 29. LECTOTYPE ♀, BELGIUM: coll. Wesmael (IRSNB, Brussels), here designated [examined].

Meteorus nigritarsis Ruthe, 1862; 21. Holotype ♀, GERMANY: Ruthe coll. (BMNH) [examined]. **Syn. n.**

Wesmael (1835: 30) stated that he had four males and three females of *pallipes*. There are presently eight specimens in Wesmael's collection labelled 'Perilitus pallipes mihi' in Wesmael's handwriting. Four of these specimens are males of *M. filator* and there is a badly damaged male specimen which is probably also *filator*; these cannot have been part of the syntype-series. There remains a female and two males which agree well with Wesmael's description of *pallipes* and I have designated these lectotype and paralectotypes respectively.

Ruthe possessed only a single specimen of *nigritarsis*. Ruthe himself noted its similarity to *pallipes* and the holotype bears a label 'P. nigritarsis m. pallip. Wsm. var?' in Ruthe's handwriting. Thomson (1895: 2152) placed *nigritarsis* in synonymy with *pallipes*, in my opinion correctly. Schmiedeknecht (1897: 184), however, keyed the two species separately, remarking that they appear to be related and referring to Thomson's action in suppressing *nigritarsis*.

♀. Antennae 26- to 31-segmented, all flagellar segments at least slightly longer than broad. Head strongly rounded behind eyes (Fig. 51). Ocelli large, OO = 2 times OD. Eyes strongly convergent. Malar space short, about half basal breadth of mandible. Face not strongly protuberant but generally with a slightly raised medial longitudinal area; smooth, punctate. Tentorial pits deep. Mandibles stout, moderately twisted. Pronotum laterally smooth, punctate, with but few rugae. Notaulices thin, foveolate; rest of mesonotum smooth, minutely punctured. Sternaulus foveolate, occasionally anteriorly with a small reticulate-foveolate area beneath, often obsolescent posteriorly; rest of mesopleuron smooth with minute punctures. Propodeum rugose, the carinae often indistinct except for the medial transverse carina which is always strongly developed. Tergite one stout with distinct dorsal pits and glymmae; dorsally generally strongly longitudinally striate, occasionally reticulate medially. Ovipositor 2·5–3·0 times length of tergite one. Hind coxa smooth, punctate; tarsal claws with distinct basal lobe.

Colour black, legs always yellow; head often yellow, at least in part, and gaster occasionally marked with yellow.

♂. Same as ♀ except antennae longer, eyes not strongly convergent.

MATERIAL EXAMINED

38 ♀. **Great Britain, Ireland, Netherlands, Sweden.**

HOSTS. No reared material examined.

REMARKS. Morphologically *pallipes* and *ictericus* are closely similar; the main points of distinction between them are to be found in the shape of the head and in the convergence of the eyes. Indeed, it is doubtful whether headless specimens of the two species could be distinguished. *M. pallipes* is a conspicuously smooth species; the face, the pronotum, the mesopleuron and the hind coxa all lack strong sculpture; the sculpture of the sternaulus is sometimes obsolescent and occasionally obsolete.

Meteorus profligator (Haliday)

(Fig. 24)

Perilitus (*Meteorus*) *profligator* Haliday, 1835: 33. Syntypes ♀, IRELAND (lost).

My interpretation of this species is based on material from A. W. Stelfox's comprehensive collection of Irish insects. The specimens named as *profligator* by Stelfox agree precisely with the description given by Haliday and I have no doubt that Stelfox's interpretation of the species is the correct one. Marshall (1887) appears to have had a different interpretation of *profligator* but the only specimen I have seen so named by Marshall agrees neither with Haliday's description nor with Marshall's statements on the species.

♀. Antennae 20- to 22-segmented, all segments of flagellum at least slightly longer than broad. Head rounded behind eyes, temple about equal in length to eye viewed dorsally. Ocelli small, OO = 3 times OD. Eyes small, not strongly protuberant, slightly convergent. Malar space slightly shorter than basal breadth of mandible. Face 1·5–2·0 times as broad as high, smooth, punctate, not strongly protuberant. Clypeus narrower than face, almost flat, its apical border weakly notched medially and usually with a weak vertical impression behind the notch. Tentorial pits distinct. Mandibles short, stout and moderately twisted. Prothorax not strongly projecting in front of the mesonotum, laterally rather smooth with only scattered weak rugae and a few large punctures. Mesothorax short, notaulices thin, foveolate. Sternaulus foveolate, sometimes rather broadened in its anterior half, becoming reticulate-foveolate. Mesopleuron reticulate-rugose dorsally, otherwise smooth, punctate. Propodeum with weak carinae between which there is weak rugose sculpture. Tergite one with large distinct dorsal pits, dorsal surface generally reticulate-rugose with a few longitudinal striae laterally. Ovipositor about twice length of tergite one, slender. Legs slender; hind coxa never strongly rugose but often with a trace of obsolescent rugosity at the base and on the outer surface. Tarsal claws not lobed but somewhat swollen basally.

Colour piceous; antennae in basal half, clypeus, mandibles and usually tergite two reddish testaceous; tegulae and legs yellow.

♂. No material examined.

MATERIAL EXAMINED

30 ♀. **Austria**: 1 ♀, Südtirol, Partschins, 750 m, 1.ix.1967 (*Haeselbarth*) (EH, Munich). **Great Britain**: 3 ♀, England, Northamptonshire, Spratton, ix.1975 (*Gauld) (BMNH); 1* ♀, E., Kent, Bexley, 16.v.1937 (*Ford*) (BMNH); 1 ♀, E., Devon, Torquay, viii.1929 (*Nixon*) (BMNH). **Ireland**: 1 ♀, Co. Wicklow, Cloughlaague, 2.ix.1953 (*Stelfox*) (USNM, Washington); 1♀, Co. Wi., Deputy's Pass, 4.ix.1932 (*Stelfox*) (USNM, Washington); 1 ♀, Co. Kildare, Royal Canal, 10.ix.1944 (*Stelfox*) (USNM, Washington); 1 ♀, Co. Dublin,

Glendhu, viii.1933, em. 24.iii.1934, ex *Cis boleti* (Scopoli) (*Stelfox*) (USNM, Washington). **Netherlands**: 19 ♀, ZH, Waarder, Oosteinde (6 ♀, viii.1973; 1 ♀, vi.1973; 6 ♀, viii.1974; 5 ♀, viii.1975; 1 ♀, ix.1975) (*van Achterberg*) (RNH, Leiden); 1 ♀, Wijster (Dr.), 27.vii.–9.viii.1973 (*van Achterberg*) (RNH, Leiden).

HOST. *Cis boleti* (Scopoli) (Coleoptera: Cisidae); this species of *Meteorus* is evidently parasitic upon the larvae of fungivorous Coleoptera.

Meteorus pulchricornis (Wesmael)

(Fig. 36)

Perilitus pulchricornis Wesmael, 1835: 42. Lectotype ♀, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels), designated by Marsh (1979) [examined].

Meteorus striatus Thomson, 1895: 2157. LECTOTYPE ♀, SWEDEN: Skåne, Palsjö (ZI, Lund), here designated [examined]. **Syn. n.**

Meteorus thomsoni Marshall, 1899: 301. [Unnecessary replacement name for *pulchricornis* Wesmael sensu Thomson.]

Meteorus japonicus Ashmead, 1906: 190. Lectotype ♀, JAPAN: Gifu, viii.1902 (USNM, Washington), designated and synonymized by Marsh (1979) [not examined].

Meteorus nipponensis Viereck, 1912: 624. Holotype ♀, JAPAN (USNM, Washington) [not examined]. [Synonymized with *japonicus* by Watanabe, 1939.]

Meteorus macedonicus Fischer, 1957*a*: 104. Holotype ♀, YUGOSLAVIA: Macedonia, Treskaslucht (NHM, Vienna) [examined]. **Syn. n.**

Meteorus graeffei Fischer, 1957*a*: 107. Holotype ♂, ITALY: 'Triest' (NHM, Vienna) [not examined]. [Synonymized with *macedonicus* by Fischer, 1970*b*: 287.]

Meteorus tuberculifer Fischer, 1957*a*: 108. Holotype ♀, ITALY: Trieste Küstenland, coll. Graeffe (NHM, Vienna) [examined]. **Syn. n.**

Wesmael (1835: 43) stated that he possessed one female and three males of *pulchricornis*; four such specimens presently stand in Wesmael's collection above this name. All are conspecific and agree well with Wesmael's description of *pulchricornis* and each bears a label 'Perilitus pulchricornis mihi' in Wesmael's handwriting. Marsh (1979) has selected the female specimen as lectotype. In Thomson's collection six conspecific specimens stand above the name *striatus*; they agree well with Thomson's description of that species. Unfortunately the lectotype, the only specimen from the type-locality, is headless. Marshall (1899: 301) evidently mistook Thomson's concept of *pulchricornis* and proposed for it a replacement name. In Thomson's collection, however, there are seven conspecific specimens standing above the name *pulchricornis* which agree with Thomson's description of the species and which are certainly conspecific with Wesmael's series of *pulchricornis*. The aciculate sculpture on tergite two in *macedonicus* led Fischer to postulate a relationship between this species, *corax* and *sulcatus*. *M. macedonicus*, however, shares none of the other characteristics which distinguish both *corax* and *sulcatus* and I do not believe *macedonicus* to be at all closely related to these species. Furthermore I have seen a few specimens of *gyrator and versicolor* which have aciculate sculpture on tergite two to a greater or lesser extent. I therefore regard this as a fortuitous sculptural aberration of no taxonomic significance. Mason (1974: 240) reached a similar conclusion with regard to *Eubazus* Nees von Esenbeck. When the aciculation of tergite two of *macedonicus* is disregarded the species falls well within the limits of variation of *pulchricornis*. *M. tuberculifer* is distinguished chiefly by the possession of large spiracular tubercles upon tergite one. Such tubercles, however, occur occasionally in several species of *Meteorus* and are developed to a lesser extent in other specimens of those species. The possession of prominent spiracular tubercles therefore appears to me to be fortuitous and of no value as a taxonomic character. Apart from the tubercles, *tuberculifer* is structurally indistinguishable from typical specimens of *pulchricornis*.

M. pulchricornis was synonymized with *gyrator* by Fischer (1970*b*: 263) but the two species are abundantly distinct and neither Tobias (1976) nor Marsh (1979) has accepted this synonymy.

♀. Antennae 29- to 33-segmented, long, slender; all flagellar segments distinctly longer than broad. Head contracted behind eyes (Fig. 36), length of eye about twice length of temple in dorsal view. Ocelli large, OO = 1·5 times OD. Eyes large, protuberant, moderately convergent. Malar space slightly shorter than basal breadth of mandible. Face not strongly protuberant but slightly raised medially, the raised area finely transversely rugose, rest of face smooth, punctate. Clypeus strongly protuberant, evenly convex, finely and densely rugose-punctate with a dense pile of erect hairs. Mandibles small, delicate and strongly twisted. Pronotum laterally rugose. Notaulices foveolate, broadened and rugose anteriorly, coalescing posteriorly into a reticulate-rugose area. Sternaulus rugose, often becoming reticulate-rugose anteriorly but never broadened. Rest of mesopleuron polished, punctate except dorsally where it is reticulate-rugose. Propodeum strongly reticulate-rugose, without distinct carinae. Tergite one longitudinally striate, usually with no dorsal pits but with indications of pits in the sculpture of the tergite; in these specimens the ventral borders of the tergite are in contact for a short distance in the mid part of the segment. Tergite one smooth laterally, sometimes with a few rugae but never with glymmae. Ovipositor 1·5–2·0 times length of tergite one. Legs long, slender; hind coxa generally completely rugose, this sculpture always fine, never reticulate though sometimes transverse. Tarsal claws with a strong basal lobe.

Colour yellow except for the notaulices, the sternauli, the subalar area of the mesopleurae, the propodeum and tergite one which are reddish brown; the tip of the gaster is often darkened and sometimes the preceding tergites. Completely pale specimens occasionally occur.

♂. Same as ♀ except antennae slightly longer; face occasionally strongly raised medially; propodeum smaller, more depressed and with greater variation in sculpture.

MATERIAL EXAMINED

96 ♀, 85 ♂. **Cyprus, France, Germany, Great Britain, Hungary, Ireland, Japan, Netherlands, Poland, Portugal, Spain, Sweden, Switzerland, Turkey.**

HOSTS. *Lycophotia porphyrea* (Denis & Schiffermüller), *Eupsilia transversa* (Hufnagel) (Lepidoptera: Noctuidae); *Lymantria dispar* (L.) (Lepidoptera: Lymantriidae); *Operophtera brumata* (L.), *Agriopis leucophaearia* (Denis & Schiffermüller), *Agriopis aurantiaria* (Hübner), *Eupithecia nanata* (Hübner) (Lepidoptera: Geometridae); *Thecla betulae* (L.) (Lepidoptera: Lycaenidae); *Nola cuculatella* (L.) (Lepidoptera: Nolidae); *Poecilocampa populi* (L.) (Lepidoptera: Lasiocampidae); *Charaxes jasius jasius* L. (Lepidoptera: Nymphalidae).

Many other hosts of *M. pulchricornis* have been recorded in the literature, some of them of considerable economic importance (see Marsh, 1979). The species is evidently catholic in its choice of hosts, attacking caterpillars of species from diverse groups of Lepidoptera.

REMARKS. The densely punctate clypeus with its dense erect vestiture of hairs make *pulchricornis* a distinctive species which is likely to be confused only with *abscissus*. The differentiation of the two species is discussed under *abscissus*.

Meteorus punctifrons Thomson

(Fig. 23)

Meteorus punctifrons Thomson, 1895: 2166. Holotype ♀, SWEDEN: Åreskutan i Jemtland (ZI, Lund) [examined].

There is one specimen under this name in Thomson's collection; it bears a locality label "Åre." (= Åreskutan, the type-locality) in Thomson's handwriting. Thomson stated that he had one specimen and the specimen labelled *punctifrons* agrees well with the description of that species and may therefore be regarded as the holotype. The specimen is in rather poor condition, the abdomen and forewings have become detached, the abdomen has been glued onto the locality label and one forewing on a small piece of celluloid attached to the pin, the second forewing is missing.

♀. Antennae 26- to 27-segmented. Head subcubic. Ocelli very small OO=4 times OD. Eyes small, only slightly convergent. Face about twice as broad as high; frons with a short groove in front of fore ocellus and between ocelli and eye with a patch of large punctures separated at most by a distance equal to their diameter. Mandible stout, slightly twisted. Pronotum very finely reticulate-rugose ventrally. Mesonotum with scattered large punctures, notaulices strongly impressed, foveolate; sternaulus foveolate. Propodeum short, depressed, weakly rugose dorsally, becoming reticulate-rugose on the sides with distinct carinae, excavate apically. Tergite one short, wide, with small but distinct dorsal pits and strong dorsolateral carinae, tergite laterally longitudinally striate with a reticulate-rugose element medially. Ovipositor short, about 1·5 times length of tergite one, down-curved. Legs very long, slender; hind coxa only slightly rugose at the base; tarsal claws long, not lobed but slightly swollen at base.

Colour brownish black; base of antennae, legs, apex of tergite one, tergite two and base of tergite three testaceous though in some specimens these parts are dark brown and the hind coxae black.

♂. Same as ♀.

MATERIAL EXAMINED

6 ♀, 3 ♂, **France**: 2 ♂, 3 ♀, Lorris Forest (Loiret), viii.–ix.1978 (*Herard*) (2 ♀, 1 ♂, BMNH; 1 ♀, 1 ♂ USDA, Sèvres). **Sweden**: 1 ♀, Sk. Åhus 18.vii.1958 (*Hedqvist*); 1 ♀, Bl. Sjöarp, 6.viii.1957 (*Ehnström*); 1 ♂, Ög Ändebol Mösstorp 2.v.1956 (*Hedqvist*) (HC, Stockholm); 1 ♀, Vb. Edefors, Harads, ix.1935 (BMNH).

HOST. *Corticeus longulus* (Gyllenhal) (Coleoptera: Tenebrionidae). The larvae of this species of beetle are scavengers in the burrows of Scolytids in conifers. It is probable that they are sometimes also facultative predators on the Scolytid larvae when these are present.

The French specimens examined came from logs of *Pinus sylvestris* which were infested with Scolytidae (Coleoptera).

REMARKS. This is a small, slender species which is rare, at least in collections; it is easily recognized by the characteristic frontal puncturation, the subcubic head and the minute ocelli.

Meteorus rubens (Nees von Esenbeck)

(Fig. 37)

Bracon rubens Nees von Esenbeck, 1811: 22. Syntypes ♀, GERMANY (lost).

Perilitus leviventris Wesmael, 1835: 46. LECTOTYPE ♀, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels), here designated [examined]. [Synonymized by Fischer, 1970*b*: 260.]

Meteorus islandicus Ruthe, 1859: 317. Syntypes, ICELAND: Staudinger coll. (NM, Vienna) [examined]. [Synonymized by Roman, 1917: 4.]

Meteorus medianus Ruthe, 1862: 53. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined]. [Synonymized with *leviventris* by Marshall, 1887: 126.]

Meteorus scutatus Costa, 1884: 172. Holotype ♀, ITALY: Oristano (MZ, Naples) [examined]. **Syn. n.**

Meteorus heteroneurus Thomson, 1895: 2158. Holotype ♀, SWEDEN: Vestergöthland (ZI, Lund) [examined]. [Synonymized by Fischer, 1970*b*: 260.]

Meteorus szechuanensis Fahringer, 1935: 11. LECTOTYPE ♀, CHINA: No Szechuan (NR, Stockholm), here designated [examined]. **Syn. n.**

Meteorus mesopotamicus Fischer, 1957*a*: 105. Holotype ♀, IRAQ: Mosul (NM, Vienna) [examined]. **Syn. n.**

Wesmael (1835: 47) stated that he possessed two specimens of *leviventris*; in his collection there now stands a single specimen above the name. This specimen, a female, is labelled 'Perilitus leviventris mihi' in Wesmael's handwriting and it agrees perfectly with the description of *leviventris*, I have therefore chosen it as lectotype.

Ruthe (1859: 317) stated that he had before him 6 ♂ and 8 ♀ of *islandicus* collected in Iceland by Staudinger. Six specimens (5 ♂, 1 ♀) presently stand above the name *islandicus* in Staudinger's collection. These specimens are conspecific, they agree with Ruthe's description of *islandicus* and they are within the limits of variation of *rubens*.

There is one specimen standing above the label 'heteroneurus' in Thomson's collection; it agrees precisely with Thomson's description of the species and bears a label 'VG' (= Vestergöthland, the published locality). I therefore regard this specimen as the holotype of *heteroneurus*. It comes well within the limits of variation of *rubens*.

There are two specimens labelled 'szechuanensis n. sp. Type' in Fahringer's handwriting in the collection of the Riksmuseet, Stockholm, each also bearing the published locality data. Both specimens are conspecific, agree with Fahringer's description of the species and are within the limits of variation of *rubens*. I have chosen as lectotype the specimen bearing a small square ticket marked 27'5, the second specimen, labelled 25'5, as paralectotype.

♀. Antennae short, 24- to 28-segmented; the segments in the distal half of the flagellum often only as long as broad but sometimes longer than this. Head behind the eyes straight for a short distance, then strongly contracted. Ocelli large, OO = 1·0–1·5 times OD. Eyes only slightly convergent. Malar space slightly less than basal breadth of mandible. Face a little less than twice as wide as high, protuberant with a medial longitudinal raised area which is finely transversely rugose, in more heavily sculptured specimens the rugosity extends onto the lateral areas of the face which are normally smooth, punctate. Clypeus protuberant, transverse, medially reticulate-punctate, laterally finely transversely rugose. Tentorial pits large, distinct. Mandibles long, moderately twisted, the upper tooth generally rather long. Pronotum laterally rugose. Mesonotum densely punctate, the punctures large and often forming a reticulate pattern, especially on the central lobe of the mesonotum. Notaulices short, foveolate, broadened anteriorly and posteriorly, coalescing into a reticulate-rugose area. Sternaulus a shallow rugose furrow; rest of mesopleuron smooth, punctate. Propodeum rugose and generally with only a medial longitudinal carina distinct though sometimes, in less heavily sculptured specimens, the basal and medial transverse carinae can be differentiated from the rugae. Tergite one generally smooth at the base and with obsolescent striae distally, occasionally almost completely smooth. Ventral borders of tergite one conjoined in the midpart of the segment; there is some variation in the extent of this conjunction but it never extends to the base of the segment. Ovipositor twice length of tergite one, thick, strongly swollen at the base and strongly narrowed in the apical sixth. Hind coxa smooth, punctate, sometimes with weak rugosity dorsally at the base. Tarsal claws never strongly bent and usually only swollen at the base but sometimes the swollen base is demarcated as a lobe and occasionally this lobe is dentate, particularly on the claws of the forelegs.

Colour varies from completely black to completely yellow with all intermediate stages represented, none of which is completely characteristic of the species.

♂. Same as ♀ except antennae longer, 26- to 30-segmented, all flagellar segments distinctly longer than broad; the propodeum is more depressed, often less strongly rugose and with the carinae more distinct.

MATERIAL EXAMINED

354 ♀, 144 ♂. **Algeria, Bulgaria, Cyprus, Denmark, Egypt, France, Germany, Great Britain, Hungary, Iceland, Ireland, Israel, Japan, Mongolia, 'Palestine', Sweden, Turkey.**

HOSTS. *Agrotis ipsilon* (Hufnagel), *Agrotis exclamationis* (L.), *Mamestra brassicae* (L.), *Spodoptera exigua* (Hübner), *Noctua pronuba* (L.) (Lepidoptera: Noctuidae); *Cynthia cardui* (L.) (Lepidoptera: Nymphalidae); *Idaea muricata* (Hufnagel) (Lepidoptera: Geometridae).

Muesebeck (1923: 32) pointed out that *rubens* [as *vulgaris* (Cresson)] is 'an important parasite of the cutworm type of Noctuid larva'.

REMARKS. *M. rubens* is a common and widespread species. It is known to be at least Holarctic in distribution and it probably also occurs in other zoogeographical regions. *M. rubens* belongs to a group of species (*heliophilus, lionotus, versicolor, pulchricornis, gyrator* and *unicolor*) characterized by the possession of relatively short, thick ovipositors which are generally distinctly narrowed shortly before the apex. *M. rubens* is distinguished from the closely related species chiefly by the characteristics of head-shape, claw-shape and length of antennae. The first tergite of *rubens* is generally rather smooth and sometimes completely so, and this is a useful ancillary character for the separation of the species.

Meteorus salicorniae Schmiedeknecht

(Fig. 20)

Meteorus salicorniae Schmiedeknecht, 1897: 189. LECTOTYPE ♀, GERMANY (EAST): Artern (MNHU, Berlin), here designated [examined].

Meteorus ocellatus Watanabe, 1951: 45. Holotype ♀, JAPAN: Kyushu Hikosan, 17.v.1948 (*Yasumatsu*) (EI, Sapporo) [not examined]. **Syn. n.**

I have examined a specimen from the collection of the MNHU, Berlin which bears two labels in Schmiedeknecht's handwriting: 'Artern [the published type-locality] Meteorus n. sp./Meteorus salicorniae Schmied. ♀'. This specimen agrees well with the description of *salicorniae* and I have no doubt that it is a syntype of that species. I have not been able to examine type-material of *ocellatus*. The description and figures of *ocellatus* clearly show that is is conspecific with *salicorniae*. The slightly longer malar space and the smaller ocellar diameter given for *ocellatus* I consider to be infraspecific variation or artefacts resulting from differing measuring techniques.

♀. Antennae 33- to 35-segmented; flagellum thick at base, strongly tapering to apex, the three basal segments at most twice as long as broad; antenna set in shallow depression in the frons which bears concentric rugae around the antennal base. Head slightly broader than thorax; temples strongly rounded, slightly longer than eye in dorsal view; occiput concave (Fig. 20). Ocelli small, OO=2·5–3·5 times OD. Eyes small, not convergent, not strongly protuberant. Malar space slightly longer than basal breadth of mandible. Face strongly protuberant, transverse, about twice as broad as high, smooth, minutely punctured. Clypeus protuberant, not as broad as face. Mandibles large, not twisted. Prothorax projecting slightly in front of mesonotum, strongly swollen laterally, largely smooth, punctate. Sternaulus very deep, foveolate, rest of mesopleuron smooth, punctate except for a strongly rugose area beneath base of wing. Propodeum high, rounded, with indistinct carinae, strongly reticulate-rugose. Tergite one strongly expanded apically, with small but distinct dorsal pits, dorsally with a medial longitudinal reticulate-foveolate area and fine longitudinal striae laterally, lateral surface of tergite strongly rugose basally. Ovipositor about 2·5 times length of tergite one, sometimes slightly more; sheaths with erect hairs which are twice as long as a sheath is broad.

Colour. Head, prothorax, gaster and legs reddish testaceous, gaster lighter in shade than the rest, thorax piceous, the mesonotum, scutellum and base of propodeum also sometimes reddish testaceous; antennae black except for the basal two or three segments.

♂. No material examined.

MATERIAL EXAMINED

Bulgaria: 1 ♀, Rhodopi, Sh. poljana 24.vi.1975 (*Zaykov*) (ZC, Plovdiv). **Austria**: 1 ♀, Südtirol, Partschins, 1000 m, FC, 20.vii.1966 (*Haeselbarth*) (EH, Munich). **Hungary**: 1 ♀, Csobanka, Oszaly, 24.vii.1973 (*Papp*) (HNHM, Budapest). ?**Yugoslavia**: 1 ♀, Graeffe coll. (BMNH).

HOSTS. No reared material examined.

REMARKS. The shape of the head and of the antennae of this species are most distinctive.

Meteorus sulcatus Szépligeti
(Figs 9, 13)

Meteorus sulcatus Szépligeti, 1896: 310. Holotype ♀, YUGOSLAVIA: Croatia, Grehovica, 10.v.1885 [published as 1882] (*Biró*) (HNHM, Budapest) [examined].

Meteorus insignis Muesebeck, 1939: 83. Holotype ♀, GREAT BRITAIN: England, Hertfordshire, Brickett Wood, 17.vi.1936 (*Benson*) (BMNH) [examined]. [Synonymized by Fischer, 1966: 395.]

Meteorus molorchi Fischer, 1966: 391. Holotype ♀, AUSTRIA: 'Österreich, Wien XIII, ob. Tirolergarten, ex Molorchus umbellatarum, vi. 1964 (*Holzschuh*)' (NHM, Vienna) [examined]. **Syn. n.**

The types of both *sulcatus* and *insignis* are in an excellent state of preservation and I have no doubt that Fischer's synonymy of the two species is correct. Fischer (1966: 394) differentiated *molorchi* by its lighter coloration, the slighter, longer antennal segments and the position of entry of the recurrent vein into the submarginal cells. I consider these characteristics to have only infraspecific value and I have been unable to find other structural characteristics by which to distinguish *molorchi*.

Muesebeck's (1939) description of *insignis* leaves little to be added.

♀. Antennae 31- to 36-segmented. Head not expanded behind eyes. Clypeus smooth, punctate. Mandibles short, stout, strongly twisted. Propodeum strongly depressed, without a strong transverse medial carina. Tergite two longitudinally striate, with distinct thyridia. Ovipositor 3·0–3·5 times length of tergite one. Tarsal claws without a distinct basal lobe but swollen at the base. Second submarginal cell conspicuously higher distally than wide (Fig. 13).

♂. No material examined.

MATERIAL EXAMINED

9 ♀. **Austria**: 1 ♀, Rohrwald, Ober-Rohrbach, 14.iii.1968 (*Legorsky*) (EH, Munich). **Great Britain**: 3 ♀, England, Hertfordshire, Brickett Wood, 17.vi.1936 (*Benson*) (paratypes of *Meteorus insignis* Muesebeck) (1 BMNH; 2 USNM, Washington); 1 ♀, same data except 8.v.1943 (BMNH). **France**: Aiguines, Var, 12.vi.1953 (*Veyret*) (MNHN, Paris). ?**Germany**: 2 ♀, no data except 'Parasit von *Semanotus undatus*' (EH, Munich). **Netherlands**: 1 ♀, Wijster (Dr), 1–14.vii.1972 (*van Achterberg*) (RNH, Leiden).

HOSTS. *Semanotus undatus* (L.), *Molorchus umbellatarum* (von Schreber) (Coleoptera: Cerambycidae).

REMARKS. The characteristics of tergite one show *sulcatus* to be closely related to *corax* which is also parasitic on Cerambycidae. *M. sulcatus* is generally a much smaller species than *corax*, though it exhibits considerable variation in size, a typical feature of parasites of wood-boring beetles.

Meteorus tabidus (Wesmael)

(Fig. 48)

Perilitus tabidus Wesmael, 1835: 32. LECTOTYPE ♂, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels), here designated [examined].

Meteorus fascialis Ruthe, 1862: 22. Holotype ♀, GERMANY. Ruthe collection (BMNH) [examined]. [Synonymized by Schmiedeknecht, 1897: 187.]

Meteorus dubius Ruthe, 1862: 27. LECTOTYPE ♀, GERMANY: Ruthe collection (BMNH), here designated [examined]. **Syn. n.**

Meteorus pentheri Fischer, 1970*b*: 262 [diagnosis in key]. Holotype ♂, YUGOSLAVIA: Stolac (*Penther*) (NHM, Vienna) [examined]. **Syn. n.**

Wesmael (1835: 33) stated that he possessed one female and three males of this species. In the Wesmael collection there are one female and two males labelled 'Perilitus tabidus mihi' in Wesmael's handwriting; they are conspecific and all agree with Wesmael's description of *tabidus*. The female specimen is in poor condition, having lost its head and three legs, and I have therefore chosen as lectotype the best preserved of the male specimens. Ruthe did not indicate what material he had of *fascialis*. There is in the collection of the BMNH one damaged specimen from Ruthe's collection labelled 'P. fascialis m.' in Ruthe's handwriting; this specimen has been labelled as type (3C 757). It agrees with the description and I am accepting this specimen as holotype of *Meteorus fascialis*. There is a female syntype from Ruthe's collection in the BMNH labelled 'P. dubius m.' in Ruthe's handwriting; this specimen, which agrees with Ruthe's description of *dubius* and is clearly within the limits of variation of *tabidus*, is designated as lectotype. Fischer (1970*b*: 258) suppressed *dubius* as a synonym of *Zemiotes* [*Zele*] *caligatus* Haliday. Van Achterberg (in litt.) states that in the MNHU, Berlin there is a female *caligatus* identified as *dubius*. It seems probable that Fischer's misinterpretation of *dubius* was based on this wrongly identified specimen.

♀. Antennae 28- to 31-segmented, thick, the penultimate five or so segments not longer than broad. Head contracted behind eyes, not distinctly rounded, the occiput not distinctly concave. OO = 2 times OD. Eyes large, strongly convergent. Malar space short, about half basal breadth of mandible. Face not strongly convex, rugulose-punctate. Clypeus strongly protuberant, abruptly divided from face, polished, sparsely punctate. Tentorial pits wide, deep, very close to orbits. Mandibles at most moderately twisted. Pronotum heavily rugose except for a smooth band along its dorsal border. Notaulices deeply impressed foveolate grooves which coalesce posteriorly into a reticulate-rugose area. Sternaulus broad, reticulate-rugose, rest of mesopleurae smooth except for a dorsal rugose area. Propodeum strongly rugose, sometimes reticulate-rugose, almost always with a distinct basal transverse carina and often with at least an indication of central longitudinal and medial transverse carinae though neither of these is easily distinguished from the rugae. Tergite one long, narrow, with distinct dorsal pits; generally strongly longitudinally striate and often with some scaly-reticulate sculpture medially. Ovipositor long, 2·5–3·0 times length of tergite one, thick. Legs long; hind coxa strongly rugose; tarsal claws with a distinct basal lobe.

Colour black; tergites 2 and 3 and legs testaceous. The face and base of the antennae sometimes lighter. There is always a lighter-coloured spot on each orbit at the level of the ocelli (though in darker specimens this sometimes almost disappears) and sometimes a lighter patch on the genae just behind the eye. The hind legs are sometimes darker; the hind coxae sometimes black. Wings generally slightly embrowned.

♂. Same as ♀ except that antennae longer, 32- to 35-segmented, all segments of flagellum at least twice as long as broad; temples longer, about equal to eyes in dorsal view; the ocelli slightly larger; the eyes not strongly convergent; propodeum depressed, often narrower and much less strongly rugose so that the carinae are more distinct; tergite one narrower, not so expanded apically sometimes almost linear and with a few coarse longitudinal striae dorsally; the colour generally darker (in the darker specimens the light orbital mark on the vertex is often reduced but it is generally still present if only as a trace).

MATERIAL EXAMINED

28 ♀, 40 ♂. **Austria, Bulgaria, France, Germany, Great Britain, Ireland, Netherlands, Sweden, Switzerland.**

HOSTS. No reared material examined.

REMARKS. *M. tabidus* is very similar to *affinis*. In addition to the characters given for their separation in the key to species, *tabidus* has a more protuberant clypeus, the area of rugosity at the junction of the notaulices smaller and the rugosity coarser, and it is generally a slightly more robust insect than *affinis*. The male of *tabidus* is exceptionally distinctive; it most resembles *consimilis* in shape of head, sculpture and colouring but is distinguished by the shorter malar space, the frons not depressed and by a generally more slender habitus.

Meteorus unicolor (Wesmael)

Perilitus unicolor Wesmael, 1835: 41. LECTOTYPE ♀, BELGIUM: Brussels, coll. Wesmael (IRSNB, Brussels), here designated [examined].
Saprotichus chinensis Holmgren, 1868: 430. Holotype ♀, CHINA (NR, Stockholm) [examined]. **Syn. n.**

Wesmael (1835: 41) stated that he had two females and a male of this species. Two specimens presently stand in his collection above the label 'unicolor'; they are conspecific and each bears a label 'Perilitus unicolor mihi' in Wesmael's handwriting and both agree precisely with Wesmael's description of the species.

♀. Antennae long, up to 36-segmented; all segments of flagellum distinctly longer than broad, most at least twice as long as broad. Head contracted behind eyes; temples slightly shorter than eyes in dorsal view. Ocelli large, OO = 2 times OD. protuberant. Eyes protuberant, slightly convergent. Malar space about equal in length to basal breadth of mandible. Face 1·5–2·0 times as broad as high, not strongly protuberant but distinctly raised medially and there transversely rugose, laterally densely punctate. Clypeus strongly protuberant, densely rugulose-punctate with scattered long hairs. Mandibles long, slender, strongly twisted. Pronotum projecting but little in front of the mesonotum; coarsely rugose laterally. Notaulices foveolate, broadened and reticulate-rugose anteriorly, coalescing posteriorly in a broad densely reticulate-rugose area. Sternaulus broadened, strongly reticulate-rugose; rest of mesopleurae smooth, punctate except for a large rugose area around the subalar prominence; prepectal carina strongly raised. Propodeum broad, shallowly excavate posteriorly; coarsely reticulate-rugose and with no distinct carinae dorsally though there is sometimes a trace of median longitudinal and transverse medial carinae. Tergite one stout with large dorsal pits and distinct glymmae; ventral borders of tergite only narrowly separated at mid point of segment; dorsal surface longitudinally striate. Ovipositor twice length of tergite one, thick, strongly swollen at base, straight. Hind coxa foveolate laterally, often with a few strong rugae dorsally. Tarsal claws with a large basal lobe.

Colour testaceous, base of tergite one paler yellow.

♂. Same as ♀ except for differences in genitalia.

MATERIAL EXAMINED

Belgium: 1 ♂, Brussels, coll. Wesmael (IRSNB, Brussels) (paralectotype of *Perilitus unicolor* Wesmael). **Germany (West)**: 1 ♀, Bavaria, Schliersee, 28.vii.1958 (*Townes*) (CNC, Ottawa). **Great Britain**: 1 ♀, Wales, Dyfed 'Pembrokeshire', 2.vii.1973 (*Ford*) (MSC, Reading).

HOST. *Zygaena filipendulae* (L.) (Lepidoptera: Zygaenidae).

REMARKS. I have seen only two specimens of this species apart from the type-material. The only characters I can find for distinguishing *unicolor* and *abscissus* are those given in the key to species and I am by no means confident that these characters would hold good in a longer series of specimens. When more material is available for study it should be possible more certainly to show whether *unicolor* and *abscissus* are but variants of a single species. *M. unicolor* has been traditionally regarded as a testaceous form of *gyrator* and the two species do resemble each other; *unicolor*, however, is a more robust and heavily sculptured insect but whether these differences will prove in the long run to be valid at the specific level is open to question.

Meteorus versicolor (Wesmael)

(Figs 41, 43)

Perilitus versicolor Wesmael, 1835: 43. Lectotype ♀, BELGIUM: Charleroy (IRSNB, Brussels), designated by Marsh (1979) [examined].
Perilitus bimaculatus Wesmael, 1835: 45. Lectotype ♀, BELGIUM: Charleroy (IRSNB, Brussels), designated by Marsh (1979) [examined]. [Synonymized by Muesebeck, 1923: 36.]
Perilitus unicolor Hartig, 1838: 254. LECTOTYPE ♀. GERMANY (ZSBS, Munich), here designated [examined]. [Junior primary homonym of *unicolor* Wesmael 1835: see *hartigi* below.]

Perilitus brevicornis Ratzeburg, 1844: 77. Holotype ♀, GERMANY: Ratzeburg collection (IP, Eberswalde) [examined]. [Synonymized by Königsmann, 1964: 654.]

Perilitus rugator Ratzeburg 1852: 59. LECTOTYPE ♀, GERMANY: '741/ neust Br./ Peril rugator ant 30 art', Ratzeburg collection (IP, Eberswalde), here designated [examined]. **Syn. n.**

Meteorus decoloratus Ruthe, 1862: 48. LECTOTYPE ♀, GERMANY: Ruthe coll. (BMNH), here designated [examined]. [Synonymized by Muesebeck, 1923: 36.]

Meteorus camptolomae Watanabe, 1939: 25. Holotype ♀, JAPAN: 'Okikuba, Tokyo' (EI, Sapporo) [not examined]. **Syn. n.**

Meteorus ikonomovi Fischer, 1959: 5. Holotype ♀, YUGOSLAVIA: Dalmatien, Gravosa (NHM, Vienna) [examined]. **Syn. n.**

Meteorus hartigi Shenefelt 1969: 69. [Replacement name for *unicolor* Hartig, 1838.] **Syn. n.**

Wesmael (1845: 43) stated only that he had many specimens of *versicolor*; three specimens now stand in Wesmael's collection above that name, all are conspecific and labelled 'Perilitus versicolor mihi' in Wesmael's handwriting. They agree well with the description of *versicolor*. There are two specimens in the collection above the name *bimaculatus*; Marsh has chosen as lectotype the specimen which best fits the description of the species.

Two conspecific female specimens presently stand above the name *unicolor* in Hartig's collection. One of these specimens bears a label 'unicolor n' in Hartig's handwriting and I have chosen this specimen as the lectotype of the species. It comes within the limits of variation of *versicolor*.

The principal character used by Ratzeburg to distinguish *rugator* was the position of entry of the recurrent vein into the cubital (submarginal) cells. I have found this structure to be variable in most species and consequently it is of little use as a taxonomic character. The specimens discussed by Königsmann (1964: 652) agree with the description of *rugator* and are within the limits of variation of *versicolor*.

I have been able to examine only two male paratypes of *camptolomae* (USNM, Washington) but these are clearly within the limits of variation of *versicolor*.

♀. Antennae 29- to 33-segmented; flagellum thick basally, tapering to apex, all segments of flagellum distinctly longer than broad, most more than twice as long as broad. Head broad, more or less strongly contracted behind eyes, eyes in dorsal view 2·5–3·0 times length of temple. Ocelli large, OO=OD, protuberant. Eyes large, protuberant, only slightly convergent. Malar space short, always less than the basal breadth of the mandible. Face about 1·5 times as broad as high, not strongly protuberant but somewhat raised medially; generally with transverse rugose sculpture, at least on the raised medial part, occasionally smooth, punctate. Clypeus protuberant. Mandibles small, delicate, strongly twisted. Pronotum not projecting before the mesonotum, laterally rugose, sometimes reticulate-rugose. Propleurae rugose-punctate. Notaulices shallow, anteriorly broadened and reticulate-rugose, posteriorly coalescing into a broad rugose area; rest of mesonotum punctate, often reticulate-punctate medially. Sternaulus a broad rather shallow furrow weakly rugose and foveolate, generally broader and sometimes reticulate-foveolate medially; often obsolescent anteriorly and posteriorly; rest of mesopleurae polished and with minute punctures; much of the sculpture of the sternaulus is so weak that it is invisible except under the most oblique light. Propodeum short, broad, strongly rugose, often reticulate-rugose with no distinct carinae but with a distinct medial impression posteriorly. Tergite one long, rather slender at the base with no dorsal pits, its ventral borders conjoined from shortly before the midpoint of the segment to its base, dorsal surface finely striate, lateral and ventral conjoined parts smooth. Ovipositor short, 1·5–2·0 times length of tergite one, thick, strongly tapered shortly before apex. Legs stout, hind coxa smooth, punctate, sometimes reticulate-punctate, often with weak transverse rugae dorsally; tarsal claws strongly curved with a pronounced basal lobe.

Colour varies from almost completely testaceous to almost completely brown; specimens occur fairly commonly in which the propodeum, tergite one except at base, hind coxa, thorax in part and head in part are black, the rest of the body and legs testaceous; sometimes the normally testaceous parts of the body are much paler yellow, almost ivory. The base of tergite one generally pale yellow.

♂. Same as ♀ except that eyes generally smaller and less protuberant. I have examined one male specimen which is completely brownish black.

MATERIAL EXAMINED

152 ♀, 108 ♂. **Austria, Bulgaria, France, Germany, Great Britain, Hungary, Ireland, Japan, Mongolia, Netherlands, 'Palestine,' Poland, Sweden.**

HOSTS. *Lasiocampa quercus* (L.), *Malacosoma neustria* (L.), *Dendrolimus pini* (L.), *Macrothylacia rubi* (L.) (Lepidoptera: Lasiocampidae); *Leucoma salicis* (L.), *Euproctis chrysorrhoea* (L.), *Dasychira pudibunda* (L.) (Lepidoptera: Lymantriidae); *Anarta myrtilli* (L.), *Lycophotia porphyrea* (Denis & Schiffermüller) (Lepidoptera: Noctuidae); *Eulithis testata* (L.) (Lepidoptera: Geometridae); *Maniola jurtina* (L.) (Lepidoptera: Satyridae); *Thaumetopoea processionea* (L.) (Lepidoptera: Thaumetopoeidae).

REMARKS. Traditionally the principal character used for the separation of *versicolor* from other species of *Meteorus* has been the presence of a pale yellow area at the base of the petiole (tergite one), which strongly contrasts with the rest of the tergite which is darker. Indeed the presence of a pale yellow band at the base of tergite one is an easy and sure way to recognize *versicolor*. In about a quarter of the specimens of *versicolor* which I have examined, however, the yellow colour at the base of tergite one is either absent or is so faint as to be indistinguishable from the condition of tergite one in several other species in which this area is sometimes slightly lighter in colour (e.g. *unicolor, obsoletus*). *M. versicolor* is structurally very close to *obsoletus*; in addition to the characters given in the key to species the pale base of tergite one is a useful means of differentiating *versicolor*, also *obsoletus* is generally a much smaller and less robust insect than *versicolor*. *M. versicolor* and, in particular, the testaceous form of this species bears a superficial resemblance to several other species of *Meteorus* (e.g. *lionotus*, *heliophilus, gyrator*), being similar in stature, length and shape of ovipositor, colour and sculpture. The ventral closure of tergite one, however, amply distinguishes *versicolor*.

Meteorus vexator (Haliday)

(Fig. 4)

Perilitus (*Meteorus*) *vexator* Haliday, 1835: 33. Neotype ♀, IRELAND: Co. Kd., R. Canal, (2), 11.vii.1943 (*Stelfox*) (USNM, Washington), designated by Fischer (1959: 12) [examined].

Fischer chose as neotype a specimen from Stelfox's collection which had been named as *vexator* by Stelfox. This specimen agrees with Haliday's exiguous description except that it has 23 antennal segments whereas Haliday gave 19–20 as the range; 20 is the least number of antennal segments I have found in the material I have examined of this species. Some workers have been misled as to the significance of the bracketed figure which appears on some of Stelfox's data labels ((2) in the type data for *vexator*). Graham (pers. comm.) states that this figure refers to the number of the collection made on the date with which it appears. Thus the neotype of *vexator* was captured in the second collection which Stelfox made on 11.vii.1943.

♀. Antennae 20- to 24-segmented, slender, all flagellar segments distinctly longer than broad. Head large, much broader than thorax, rounded behind eyes and also more or less strongly contracted; eyes in dorsal view at most twice length of temple. Ocelli small, OO = 2·5–3·0 times OD. Eyes large, protuberant, very strongly convergent. Malar space short, much less than basal breadth of mandible. Face small, about as broad as high, not protuberant, smooth, punctate. Clypeus moderately protuberant, smooth, punctate. Tentorial pits distinct and very close to margin of eye. Mandibles short, stout, moderately twisted. Pronotum laterally generally with weak rugose sculpture. Notaulices narrow but distinct, foveolate. Sternaulus narrow, foveolate, sometimes with a small punctate patch beneath; rest of mesopleurae polished except for a small reticulate area beneath the base of the forewing. Propodeum small, distinctly carinate, generally rather smooth between the carinae but sometimes weakly rugulose. Tergite one with distinct dorsal pits at about its midpoint or slightly before; dorsal surface strongly rugose with at most a few weak striae laterally, the lateral faces of the tergite strongly rugose. Ovipositor 2·5–3·0 times length of tergite one. Legs long, slender, hind tibia not unusually swollen, narrower than femur; hind coxa generally at least slightly rugose ventro-laterally though sometimes reticulate-punctate; tarsal claws without a basal lobe.

Colour brownish black, legs testaceous; face, clypeus, mandibles, antennae at the base, pronotum ventrally and tergite two sometimes lighter in colour; hind coxa sometimes infuscate in part, occasionally entirely dark.

♂. Same as ♀ except antennae longer, up to 27-segmented; eyes less convergent and sculpture of sternaulus and of hind coxa sometimes obsolete.

MATERIAL EXAMINED

105 ♀. **Austria, Great Britain, Ireland, Netherlands, Sweden.**

HOST. *Biphyllus lunatus* (Fabricius) (Coleoptera: Biphyllidae).

REMARKS. I have examined a male specimen belonging to the series on which Morley (1912) based his description of *vexator*. This specimen is certainly conspecific with *vexator* the interpretation of which has been fixed by the designation of a neotype (Fischer, 1959: 12). Morley's association of *vexator* with *Biphyllus lunatus* (Fabricius) is as yet the only indication of a probable host of the species though I consider the evidence upon which Morley based his record to be less conclusive than he stated.

Nomina dubia

Meteorus dejeanus (Rondani)

Perilitus dejeanus Rondani, 1874: 131. Type-material not found.

Meteorus delator (Haliday)

Perilitus (*Meteorus*) *delator* Haliday, 1835: 33. Type-material not found.

Meteorus dilutus (Ratzeburg)

Perilitus dilutus Ratzeburg 1844: 77. Type-material lost.

Meteorus effeminatus Ruthe

Meteorus effeminatus Ruthe, 1862: 32.

Ruthe stated that he had two male specimens which he referred to as *effeminatus*. I have examined these specimens but I have not been able to reach a conclusion about their placement.

Meteorus flaviceps (Ratzeburg)

Perilitus flaviceps Ratzeburg, 1844. 75. Type-material lost.

Meteorus gracilis (Ratzeburg)

Perilitus gracilis Ratzeburg, 1852: 58. Type-material lost.

Meteorus longicornis (Ratzeburg)

Perilitus longicornis Ratzeburg, 1844: 76. Type-material lost.

Meteorus pallidus (Nees von Esenbeck)

Bracon pallidus Nees von Esenbeck, 1812: 22. Type-material lost.

Fischer (1970*b*: 258) placed *pallidus* in *Zemiotes* which then had the rank of a subgenus in *Meteorus*. Van Achterberg (1979: 387) has pointed out that Nees stated there were no dorsal pits on tergite one of *pallidus* and that this precludes Fischer's placement of that species. Van Achterberg therefore concludes that *pallidus* belongs in *Meteorus*. I have, however, been unable to identify the species.

Meteorus pendulator (Latreille)

Ichneumon pendulator Latreille, 1799: 138. Type-material lost.

I have unfortunately been unable to interpret *pendulator*. Marshall (1887: 100) followed Haliday (1835: 28) in placing *pendulator* and *ictericus* in synonymy. The series standing above the name *pendulator* in Haliday's collection includes specimens of both *ictericus* and *gyrator*. The description and figure of *pendulator* show it to have a shorter ovipositor and to be lighter in colour than *ictericus*. *M. pendulator* could quite well be conspecific with *gyrator* but the description is not sufficiently precise to preclude other species.

Meteorus rubriceps (Ratzeburg)

Perilitus rubriceps Ratzeburg, 1844: 75. Type-material lost.

Meteorus ruficeps (Nees von Esenbeck)

Perilitus ruficeps Nees von Esenbeck, 1834: 39. Type-material lost.

Meteorus rufus (DeGeer)

Ichneumon rufus DeGeer, 1778: 597. Type-material lost.

There is a label in the DeGeer collection for '*Ichneumon rufus*' but there is no specimen present. There is no pinhole in the cork above the label which indicates that no specimen was present in the collection when it was transferred to its present cabinet in 1845.

Meteorus stenostigma Thomson

Meteorus stenostigma Thomson, 1895: 2153. Type-material lost.

Two specimens stand in Thomson's collection above the name *stenostigma*. Neither of them agrees precisely with Thomson's description and neither is from the type-locality.

Meteorus wesmaeli (Boie)

Perilitus wesmaeli Boie, 1850: 214. Type-material not found.

Acknowledgements

I wish to thank Professor B.-O. Landin and Mr R. Danielsson (Lund); Professor E. Sylven (Stockholm) and Dr L. Hedstrom (Uppsala) for the provision of study facilities and cordial hospitality in their respective departments during August 1976, and Mr G. Nordlander for his hospitality on that occasion. I wish also to thank the following for the loan of material and for much other valuable assistance: Dr C. van Achterberg (Leiden); Dr A. A. Allen (Reigate); Mr R. Danielsson (Lund); Dr E. Diller (Munich); Dr P. Dessart (Brussels); Dr M. Fischer (Vienna); Dr M. W. R. de V. Graham (Oxford); Dr E. Haeselbarth (Munich); Dr K.-J. Hedqvist (Stockholm); Dr L. Hedstrom (Uppsala); Dr E. Königsmann (Berlin); Dr P. M. Marsh (Washington); Dr W. R. M. Mason (Ottawa); Dr J. P. O'Connor (Dublin); Professor G. Morge (Berlin); Dr J. Papp (Budapest); Dr M. Shaw (Reading); Dr B. Sigwalt (Paris); Dr H. D. Volkart (Berne); Dr A. Zaykov (Plovdiv); Drs K. Zwart (Wageningen) and many colleagues in the British Museum (Natural History).

References

Achtelig, M. 1974. Beschreibung des Männchens von *Meteorus pachypus* Schmiedeknecht (Braconidae: Hymenoptera) ein unbekannter Parasit von *Raphidia xanthostigma* (Raphidioptera). *NachrBl. bayer. Ent.* **23**: 1–5.

Achterberg, C. van 1974. A preliminary key to the subfamilies of the Braconidae (Hymenoptera). *Tijdschr. Ent.* **119**: 33–78.

—— 1979. A revision of the subfamily Zelinae auct. (Hym., Bracondiae). *Tijdschr. Ent.* **122**: 241–479.

Ashmead, W. H. 1906. Descriptions of new Hymenoptera from Japan. *Proc. U.S. natn. Mus.* **30**: 169–201.

Boie, F. 1850. Entomologische Beiträge. *Stettin. ent. Ztg* **11**: 212–216.

Burgst, S. van 1919. Braconidae (Hym.) faun nov. spec. aanwezig in de collectie van het Rijk. *Tijdschr. Ent.* **62**: 104–106.

Capek, M. 1970. A new classification of the Braconidae (Hymenoptera) based on the cephalic structures of the final instar larva and biological evidence. *Can. Ent.* **102**: 846–875.

Costa, A. 1884. Notizie ed osservazioni sulla geofauna Sarda. *Accad. Sci. fis. mat., Napoli* **22**: 171–172.

Curtis J. 1832. *British entomology*. **9**: folio 415. London.

DeGeer, C. 1978. *Mémoires pour servir à l'histoire des insectes*. **7**: 950 pp. Stockholm.

Dessart, P. 1972. A propos de la date de parution d'une monographie de C. Wesmael (Hymenoptera: Braconidae). *Bull. Annls Soc. r. ent. Belg.* **108**: 272–273.

Fahringer, J. 1935. Swedisch-chinesische wissenschaftliche Expedition nach den nordwestlichen Provinzen Chinas, 26 Hymenoptera, 4 Braconidae Kirby. *Ark. Zool.* **27** (A) (12): 1–15.

Fischer, M. 1957*a*. Neue Paläarktische *Meteorus*-Arten (Hym., Braconidae) *Annln naturh. Mus. Wien* **61**: 104–109.

—— 1957*b*. Zur Kenntnis der Gattung *Meteorus* Hal. (Hymenoptera, Braconidae). *Opusc. zool. Münch.* no. 3: 1–5.

—— 1957*c*. Beiträge zur Kenntnis der Paläarktischen Braconiden. *Mitt. münch. ent. Ges.* **47**: 1–21.

—— 1959*a*. Zur Kenntnis der Thomson'schen Braconiden-Arten V. (Hymenoptera). *Ent. NachrBl. oest. schw. Ent.* **11** (3): 74–82.

—— 1959*b*. Neue und wenig bekannte Braconiden aus Jugoslavien (Hymenoptera). *Acta Mus. maced. Sci. nat.* **6** (1): 1–25.

—— 1966. Gezuchtete Braconiden aus Niederösterreich und aus dem Burgenland (Hymenoptera). *Z. angew. Ent.* **53**: 385–402.

—— 1970*a*. Redeskription von drei *Meteorus*-Arten aus der Sammlung C. Wesmael in Brüssel (Hymenoptera, Braconidae). *NachrBl. bayer. Ent.* **18** : 50–56.

—— 1970*b*. Die *Meteorus*-Arten des Burgenlandes (Hymenoptera, Braconidae, Euphorinae). *Wiss. Arb. Burgenld.* **44**: 254–300.

Griffiths, G. C. D. 1964. The Alysiinae (Hym. Braconidae) parasites of the Agromyzidae (Diptera). *Beitr. Ent.* **14**: 823–914.

Haliday, A. H. 1835. Essay on parasitic Hymenoptera. *Ent. Mag.* **3**: 20–45.

Hartig, T. 1838. Ueber den Raupenfrass im Königl. Charlottenberger Forste unfern Berlin, während des Sommers 1837. *Jber. Fortschr. Forstwiss.forstl. Naturk.* **1**: 246–274.

Holmgren, A. E. 1868. Kongliga Svenska Fregatten Eugenies Resa omkring Jordon. *Vetenskapliga lakitagelser* Zoologi; 1 Insecta, Haft 12 Hymenoptera, pp. 391–442.

Johansson, S. 1964. A new *Meteorus* species from Sweden (Hymenoptera: Braconidae). *Opusc. Ent.* **29**: 251–253.

Königsmann, E. 1964. Braconidae aus den Resten der Ratzeburg-Sammlung (Hymenoptera). *Beitr. Ent.* **14**: 631–661.

Latreille, P. A. 1799. Sur une nouvelle espèce d'ichneumon. *Bull. Soc. philomath. Paris* **2**: 138.

Lyle, G. T. 1913. Description of a new species of *Meteorus* (Braconidae). *Entomologist* **46**: 244–245.

—— 1914. Contributions to our knowledge of British Braconidae no. 1, Meteoridae. *Entomologist* **47**: 73–77.

Madel, G. 1963. Beiträge zur Morphologie und Biologie von *Meteorus fragilis* Wesm. (Hym. Braconidae) – ein Endoparasit des Mondvogels *Phalera bucephala* L. (Lep., Notodontidae). *Z. angew. Ent.* **53**: 1–47.

Marsh, P. M. 1979. The Braconid (Hymenoptera) parasites of the Gypsy Moth, *Lymantria dispar* (L.) (Lepidoptera: Lymantridae). *Ann. ent. Soc. Am.* **72**: 794–810.

Marshall, T. A. 1887. Monograph of British Braconidae, Part II. *Trans. ent. Soc. Lond.* **1887**: 51–131.

—— 1891. *In* André, E., *Spécies des Hyménoptères d'Europe et d'Algérie.* **5**: 635 pp. Beaune (Côte-d'Or).

—— 1897–1900. Ibid. **5** bis: 373 pp.

Mason, W. R. M. 1973. Recognition of *Zemiotes* (Hymenoptera: Braconidae). *Proc. ent. Soc. Wash.* **75**: 213–215.

—— 1974. A generic synopsis of Brachistini (Hymenoptera: Braconidae) and recognition of the name *Charmon* Haliday. *Proc. ent. Soc. Wash.* **76**: 235–246.

Minamikawa, J. 1954. On the hymenopterous parasites of the tea-leafrollers found in Japan and Formosa. *Mushi* **26** (8): 35–46.

Morley, C. 1908. Notes on British Braconidae VI. Meteoridae. *Entomologist* **41**: 125–129, 148–150.

—— 1912. Rediscovery of the braconid *Meteorus vexator* (Hal.), with a description of the male. *Entomologist* **45**: 4–5.

Muesebeck, C. F. W. 1923. A revision of the North American species of Ichneumon-flies belonging to the genus *Meteorus* Haliday. *Proc. U.S. natn. Mus.* **63**: 1–44.

—— 1936. The genera of parasitic wasps of the braconid subfamily Euphorinae with a review of the Nearctic species. *Misc. Publs U.S. Dep. Agric.* no. 241: 1–37.

—— 1939. Five new species of *Meteorus* (Hymenoptera: Braconidae). *Proc. ent. Soc. Wash.* **41**: 83–87.

—— 1954. Some braconid parasites of the pink bollworm *Pectinophora gossypiella* (Saunders). *Boll. Lab. Ent. agr. Filippo Silvestri* **33**: 57–68.

Nees von Esenbeck, C. G. 1811. Ichneumonides adsciti, in genera et familias divisi. *Mag. Ges. Naturf. fr. Berlin* **5**: 3–37.

—— 1834. *Hymenopterorum Ichneumonibus affinium monographiae, genera Europaea et species illustrantes* **1**: 320 pp. Stuttgart, Tübingen, Cotta.

Nixon, G. E. J. 1943. A synopsis of the African species of *Meteorus* (Hym., Braconidae). *Bull. ent. Res.* **34**: 53–64.

Papp, J. 1973. Contributions to the braconid fauna of Yugoslavia (Hymenoptera, Braconidae) I. *Acta Mus. maced. Sci. nat.* **14** (1): 1–21.

Ratzeburg, J. T. C. 1844. *Die Ichneumonen der Forstinsekten in forstlicher und entomologischer Beziehung* **1**: 224 pp. Berlin.

—— 1848. *Die Ichneumonen der Forstinsekten in forstlicher und entomologischer Beziehung* **2**: 238 pp. Berlin.

—— 1852. *Die Ichneumonen der Forstinsekten in forstlicher und entomologischer Beziehung* **3**: 272 pp. Berlin.

Richards. O. W. 1977. Hymenoptera. Introduction and key to families. 2nd edn. *Handbk Ident. Br. Insects* **6** (1): 100 pp.

Roman, A. 1912. Die Ichneumonidentypen C. P. Thunbergs. *Zool. Bidr. Upps.* **1**: 229–293.

—— 1917. Braconiden aus den Färöern. *Ark. Zool.* **11** (7): 1–10.

Rondani, C. 1874. Nuove osservazioni sugli insetti fitofagi e sui loco parassiti. *Boll. Soc. ent. ital.* **6**: 130–136.

Ruthe, J. F. 1859. Verzeichniss der von Dr Staudinger im Jahre 1856 auf Island gesammelten Hymenopteren. *Stettin. ent. Ztg* **20**: 305–322.

—— 1862. Deutsche Braconiden. Drittes Stück. *Berl. ent. Z.* **6**: 1–58.

Schmiedeknecht, H. L. O. 1897. Die Braconiden-Gattung *Meteorus* Hal. *Illte Wschr. Ent.* **2**: 150–154, 173–175, 184–190, 204–207, 221–223, 298–302.

Schönwiese, F. 1934. Beobachtungen und Versuche anlässlich einer Übervermehrung von *Lophyrus sertifer* Geoffr. (*rufus* Panz.) in Südkärnten in den Jahren 1931'1932. *Z. angew. Ent.* **21**: 463–500.

Shenefelt, R. D. 1969. Hymenopterorum catalogus (nov. ed.) part 4 Braconidae **1**: 1–176, Junk, 'S-Gravenhage.

Spinola, M. 1808. Insectorum liguriae species novae an rariores, quas in agro Ligustico nuper detexit, descripsit, et iconibus illustvit (Hymenoptera). **2**: 262 pp. Genuae.

Szépligeti, G. V. 1896. Beiträge zur Kenntnis der Ungarischen Braconiden. *Terméezetr. Füz.* **19**: 359–386

Thomson, C. G. 1895. Bidrag till Braconidernas kännedom. *Opusc. Ent.* **20**: 2141–2339.

Thunberg, C. P. 1822. Ichneumonidea, insecta Hymenoptera, illustrata. *Mem. Akad. St. Petersburg* **8**: 249–281.

Tobias, V. I. 1966. Genera groupings and evolution of the subfamily Euphorinae (Hymenoptera: Braconidae) part 2. [In Russian.] *Ent. Obozr.* **45**: 612–633.

—— 1976. Braconidae of the Caucasus. [In Russian.] *Opred. Faune SSSR.* **110**: 1–286.

Viereck, H. L. 1912. Contributions to our knowledge of bees and ichneumon-flies, including the descriptions of twenty-one new genera and fifty-seven new species of ichneumon-flies. *Proc. U.S. natn. Mus.* **42**: 613–648.

—— 1914. Type-species of the genera of ichneumon-flies. *Bull. U.S. natn. Mus.* no. 83: 186 pp.

Watanabe, C. 1939*a*. *Meteorus japonicus* Ashmead, a parasite of the Gypsy Moth *Lymantria dispar* Linné (Hymenoptera: Braconidae). *Insecta matsum.* **13**: 63–65.

—— 1939*b*. A new species of *Meteorus* bred from *Camptoloma interiorata* Walker (Hymenoptera: Braconidae). *Insecta matsum.* **14**: 25–26.

—— 1951. A new species of the genus *Meteorus* Haliday from Japan (Hymenoptera: Braconidae). *Mushi* **22** (6): 45–46.

Wesmael, C. 1835. Monographie des Braconides de Belgique. *Nouv. Mém. Acad. R. sci. Bruxelles* **9**: 1–252.

—— 1838. Monographie des Braconides de Belgique IV. *Nouv. Mém. Acad. R. sci. Bruxelles* **11**: 1–166.

Westwood, J. O. 1839. *An introduction to the modern classification of insects.* **2**: 587 pp. + Synopsis 158 pp. London.

Index

Invalid names are in *italics*.

abdominator 20
abscissus 21
adoxophyesi 34
affinis 22
albicornis 27
ambiguus 24
atrator 24

bimaculatus 51
brevicauda 23
brevicornis 52
brevipes 20, 27
brevipesalis 20
brunnipes 20

camptolomae 52
cespitator 24
chinensis 51
cinctellus 25
colon 26
confinis 34
consimilis 27
consors 34
corax 28

crassicrus 34

decoloratus 52
dejeanus 54
delator 54
dilutus 54
dubius 50

eadyi 29
effeminatus 54
ephippium 34

fallax 34
fascialis 50
fasciatus 26
filator 30
flaviceps 54
fodori 41
formosus 41
fragilis 26
fuscipes 25

gracilis (Ratzeburg) 54
gracilis Ruthe 22
graciliventris 31
graeffei 45
gyrator 31

hartigi 52
heliophilus 32
heteroneurus 47
hirsutipes 33
hodisensis 30

ictericus 34
ikonomovi 52
insignis 49
islandicus 47

jaculator 36
japonicus 45

laticeps 30
leviventris 47
lionotus 37
liquis 34
longicaudis 38
longicornis 54
lophyriphagus 34
luridus 26

macedonicus 45
medianus 47
melanostictus 38
mesopotamicus 47
micropterus 39
minutor 34
molorchi 49
mongolicus 23
monochami 28

niger 38
nigritarsis 43
nipponensis 45
nixoni 40

obfuscatus 41
obscurellus 36
obsoletus 41
ocellatus 48
oculatus 42

pachypus 42
pallidus 54
pallipes 43
parvulus 32
pendulator 54
pentheri 50
pleuralis 34
profligator 44
pulchricornis 45
punctifrons 46
punctiventris 22

rubens 47
rubriceps 54
ruficeps 54
ruficoloratus 37
rufus 55
rugator 52
ruthei 22

salicorniae 48
scutatus 47
scutellator 31
similator 24
stenostigma 55
striatus 45
sulcatus 49
szechuanensis 47

tabidus 50
tenellus 25
tenuicornis 36
thomsoni 45
thoracicus 41
thuringiacus 23
tuberculifer 45

unicolor Hartig 51
unicolor (Wesmael) 51

versicolor 51
vexator 53
viridanae 42
voloscensis 22

wesmaeli 55

xanthomelas 34

Other British Museum (Natural History) Publications on the Hymenoptera:

African bees of the genera *Ceratina*, *Halictus* and *Megachile*. T. D. A. Cockerell.

1937, xvi+254 pp, 50 text figures, 8vo, £7·15

A revision of the Leucospidae (Hymenoptera: Chalcidoidea) of the World. Z. Bouček.

Bull. British Museum (Natural History) Entom. Supp. No 23, 1974, 241 pp, 272 text figures, 4to paper, £14·00

The Pteromalidae of north-western Europe (Hymenoptera: Chalcidoidea). M. W. R. de V. Graham.

Bull. British Museum (Natural History) Entom. Supp. No 16, 1969, 908 pp, 686 text figures, 4to paper, £33·00

A revisional study of the Masarid wasps (Hymenoptera: Vespoidea). O. W. Richards.

1962, 294 pp, 241 text figures, 4to, £9·35

The social wasps of the Americas excluding the Vespinae. O. W. Richards.

1978, 571 pp, 159 text figures, 4 plates (colour), 4to cloth, £32·50

Publications Sales
British Museum (Natural History)
Cromwell Road
London SW7 5BD

Standing orders placed by educational institutions earn a discount of 10% off our published price.

Titles to be published in Volume 41

A revision of the western Palaearctic species of the genus *Meteorus* (Hymenoptera: Braconidae). By T. Huddleston.

A revision of the Old World Polymorphanisini (Trichoptera: Hydropsychidae) By P. C. Barnard.

A review of the genera of Neotropical Encyrtidae (Hymenoptera: Chalcidoidea). By John S. Noyes.

A revision of the British species of *Dendrocerus* Ratzeburg (Hymenoptera: Ceraphronoidea) with a review of their biology as aphid hyperparasites. By N. D. M. Fergusson.

A revision of the Pacific species of *Conocephalus* Thunberg (Orthoptera: Tettigoniidae). By L. M. Pitkin.

Printed by The Whitefriars Press Ltd, London and Tonbridge

BRITISH MUSEUM
GENERAL
-2 OCT 1980
LIBRARY
NATURAL HISTORY

Bulletin of the
British Museum (Natural History)

A revision of the Old World Polymorphanisini (Trichoptera: Hydropsychidae)

P. C. Barnard

Entomology series
Vol 41 No 2 25 September 1980

The *Bulletin of the British Museum* (*Natural History*), instituted in 1949, is issued in four scientific series, Botany, Entomology, Geology (incorporating Mineralogy) and Zoology, and an Historical series.

Papers in the *Bulletin* are primarily the results of research carried out on the unique and ever-growing collections of the Museum, both by the scientific staff of the Museum and by specialists from elsewhere who make use of the Museum's resources. Many of the papers are works of reference that will remain indispensable for years to come.

Parts are published at irregular intervals as they become ready, each is complete in itself, available separately, and individually priced. Volumes contain about 300 pages and are not necessarily completed within one calendar year. Subscriptions may be placed for one or more series. Subscriptions vary according to the contents of the Volume and are based on a forecast list of titles. As each Volume nears completion, subscribers are informed of the cost of the next Volume and invited to renew their subscriptions. Orders and enquiries should be sent to:

Publications Sales,
British Museum (Natural History),
Cromwell Road,
London SW7 5BD,
England.

World List abbreviation: *Bull. Br. Mus. nat. Hist.* (Ent.)

© Trustees of the British Museum (Natural History), 1980

ISSN 0524–6431

Entomology series
Vol 41 No 2 pp 59–106

British Museum (Natural History)
Cromwell Road
London SW7 5BD

Issued 25 September 1980

A revision of the Old World Polymorphanisini (Trichoptera: Hydropsychidae)

BRITISH MUSEUM
GENERAL
-2 OCT 1980
LIBRARY
NATURAL HISTORY

P. C. Barnard K

Department of Entomology, British Museum (Natural History), Cromwell Road, London SW7 5BD

Contents

- Synopsis . . . 59
- Introduction . . . 59
  - Classification of the Macronematinae . . . 60
- Abbreviations . . . 60
- Acknowledgements . . . 61
- Taxonomic section . . . 61
  - Tribe Polymorphanisini Lestage . . . 61
    - Geographical distribution . . . 63
    - Biology . . . 63
    - Check-list of Old World Polymorphanisini . . . 63
    - Key to world genera of Polymorphanisini . . . 64
  - *Oestropsyche* Brauer . . . 64
  - *Aethaloptera* Brauer . . . 66
    - Key to species of *Aethaloptera* . . . 68
  - *Polymorphanisus* Walker . . . 78
    - Key to species of *Polymorphanisus* . . . 78
    - The *nigricornis*-group . . . 79
    - The *ocularis*-group . . . 98
- References . . . 103
- Index . . . 105

Synopsis

The Old World species of the tribe Polymorphanisini, with its constituent genera *Oestropsyche* Brauer, *Aethaloptera* Brauer and *Polymorphanisus* Walker, are revised. One new generic and eight new specific synonyms are established; four new species are described. Seven lectotypes and one neotype are designated. Keys are given to the twenty-five species currently recognized.

Introduction

The Polymorphanisini are one of the most discrete tribes within the Hydropsychidae; although they are superficially very similar to the other species of the subfamily Macronematinae, they have an obvious diagnostic character in the absence of mouthparts. This paper deals only with the Old World species; the endemic Neotropical genus *Synoestropsis* is distinguished in the key to genera, but most of its constituent species are dealt with in recent publications by O. S. Flint, Jr (e.g. Flint, 1978).

The subfamily Macronematinae was revised by Ulmer (1907) and this remains the basis for any work on this group, Ulmer's monograph being complete for all the literature up to that date. Although many of the species of the tribe Macronematini, especially of *Macronema* itself, can be readily identified by their wing pattern, the Polymorphanisini are relatively uniform in general

Bull. Br. Mus. nat. Hist. (Ent.) **41** (2): 59–106

Issued 25 September 1980

appearance and have always been considered a difficult group to identify correctly. For example, in his paper on the Trichoptera of Ghana, Gibbs (1973) remarks 'Because of a lack of modern figures of male genitalia, African species of *Polymorphanisus* are usually in some doubt.' I hope the present paper will remove this difficulty, but in fact a study of the genitalia has not yielded many useful characters. The keys are based on 'external' characters, namely features of the wing venation, coloration, thoracic markings and so on, and these, together with the known distribution of the species, are sufficient to separate all the species in the tribe. The genitalia of both sexes (where known) of each species are described and figured, however, because they are often useful in confirming the identity of superficially similar species. Of the 25 species included in this paper, the males of ten are unknown, which is another reason for the limited use of genitalic characters.

All the drawings in this paper were made using a camera lucida attachment on a stereomicroscope. Male genitalia preparations were examined and drawn in glycerine to avoid any distortion due to flattening. In the females the eighth sternite, which was the only feature found to exhibit consistent specific characters, was drawn from permanent preparations in Euparal, deliberately flattened to facilitate comparability of outline of this curved sclerite.

Classification of the Macronematinae

The first division of the Hydropsychidae was made by Brauer (1868) who erected the 'subfamily' Oestropsidae, for *Oestropsis* and *Polymorphanisus,* on the basis of the absence of the palps: *Macronema* was retained in the Hydropsychidae sensu stricto. Later, Brauer (1875) described the genus *Phanostoma* which he also placed in the Oestropsidae along with *Aethaloptera,* although *Phanostoma* (now synonymized with *Amphipsyche*) has normal mouthparts.

McLachlan (1878: 350, 353) divided the Hydropsychidae into five sections: his section I corresponds with Brauer's Oestropsidae, containing *Polymorphanisus, Oestropsis, Phanostoma, Aethaloptera* and *Amphipsyche.* Ulmer (1907) united McLachlan's sections I and II (which contained *Macronema* and *Blepharopus*) to form the Macronematinae, stating that the name Oestropsidae could not be used, not even in the form Oestropsinae, because *Oestropsis* had been synonymized with *Polymorphanisus.* This change of name has been generally accepted by authors and is therefore retained under Art. 40 (a) of the *International Code of Zoological Nomenclature.* Denning (1943) tried to revive the name Oestropsinae in preference to Ulmer's Macronematinae but other authors have not accepted this change. Two other minor changes to this group name have been proposed: Banks (1913) uses the Macronematidae as a family name (apparently in the same sense as Ulmer's subfamily), and Navás (1926) reduced the group to a tribe, but neither change has been accepted by subsequent authors.

The first attempt at splitting the Macronematinae sensu Ulmer was by Lestage (1936) who divided the subfamily into two tribes, the Macronematini and the Polymorphanisini, the latter distinguished by the loss of the palps. This division has been accepted by most authors and is the one adopted in the present paper. Surprisingly, Ulmer (1951) continued to use his subfamily Macronematinae with no further subdivision. Banks's (1939) introduction of the name Oestropsychinae is difficult to interpret as the group apparently includes *Polymorphanisus, Oestropsyche* and *Amphipsyche.* If it is intended to replace the Polymorphanisini then *Amphipsyche* is erroneously included, but in any case it is an unnecessary replacement name. Marlier (1962) accepts Lestage's division of the subfamily but renames the Polymorphanisini as the Oestropsychini, which again is an unnecessary replacement name. The only other change recently proposed is the standardization of the tribe name to Polymorphanisini by Flint (1974; 1978) and Scott (1975).

Abbreviations

AM	Albany Museum, Grahamstown
ANIC	Australian National Insect Collection, C.S.I.R.O., Canberra
BMNH	British Museum (Natural History), London
IM	Indian Museum, Calcutta

IRSNB	Institut Royal des Sciences Naturelles de Belgique, Brussels
IZPAN	Instytut Zoologiczny, Polska Akademia Nauk, Warsaw
MCZ	Museum of Comparative Zoology, Harvard
MNHN	Muséum National d'Histoire Naturelle, Paris
MNHU	Museum für Naturkunde der Humboldt-Universität, Berlin
MRAC	Musée Royal de l'Afrique Centrale, Tervuren
NM	Naturhistorisches Museum, Vienna
NMV	National Museum of Victoria, Melbourne
RNH	Rijksmuseum van Natuurlijke Historie, Leiden
USNM	U.S. National Museum, Smithsonian Institution, Washington
ZI	Zoological Institute, Leningrad
ZM	Zoologisches Museum, Hamburg

Acknowledgements

I am very grateful to the following for the loan or donation of specimens: Ms J. Cardale, C.S.I.R.O., Canberra; Dr J. Decelle, MRAC, Tervuren; Dr O. S. Flint, Jr, USNM, Washington; Dr D. C. Geijskes, RNH, Leiden; Dr H. J. Hanneman, MNHU, Berlin; Dr A. Kaltenbach, NM, Vienna; Dr J. Legrand, MNHN, Paris; Dr A. Liana, IZPAN, Warsaw; Dr G. Marlier, IRSNB, Brussels; Dr K. M. F. Scott, AM, Grahamstown; Prof. Dr H. Strümpel, ZM, Hamburg; Ms M. K. Thayer, MCZ, Harvard. Thanks are also due to Dr A. Neboiss, NMV, Melbourne, for bringing the Australian material to my attention. I am grateful to my colleague Dr P. E. S. Whalley for commenting on the manuscript.

Taxonomic section

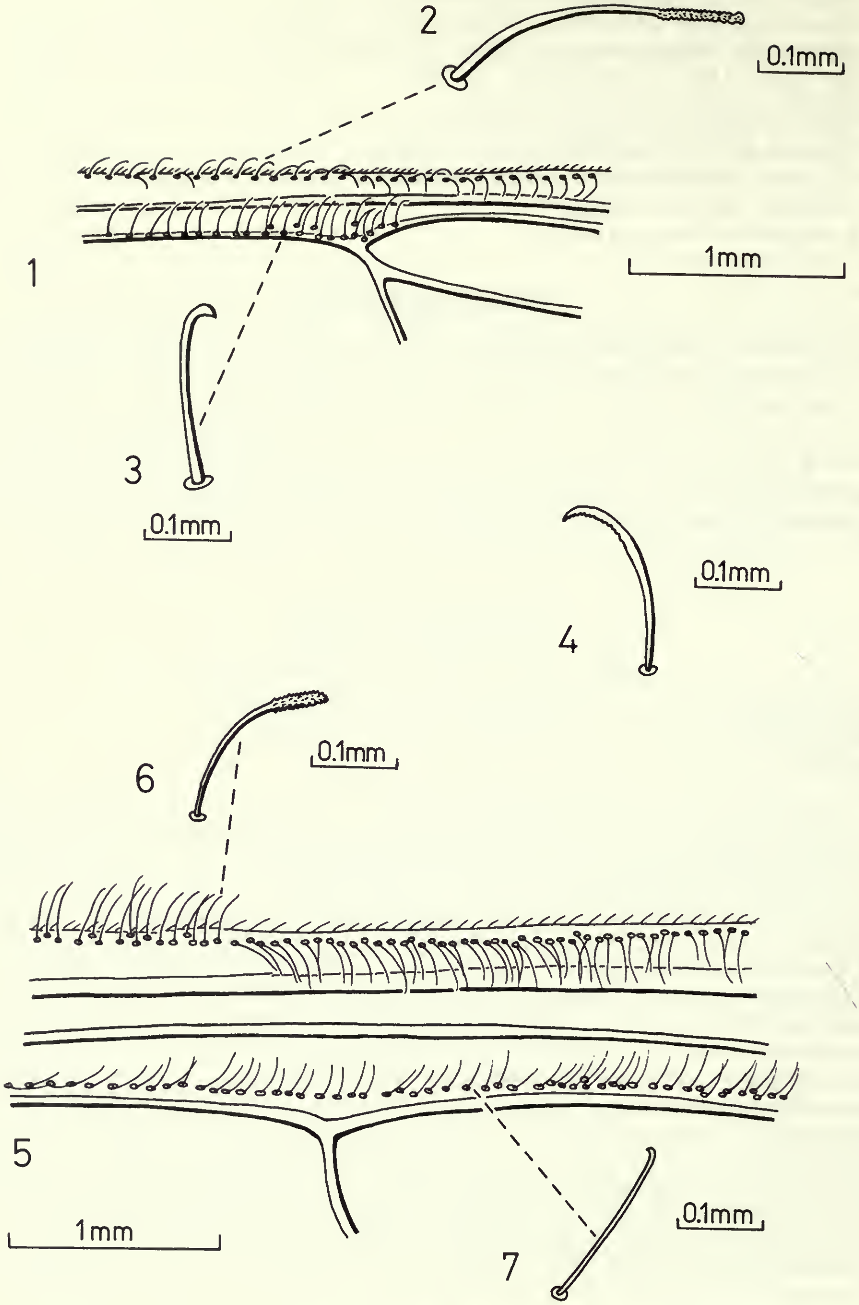
Tribe **POLYMORPHANISINI** Lestage

Polymorphanisi Lestage, 1936: 176. Type-genus: *Polymorphanisus* Walker.
Oestropsychini Marlier, 1962: 118. Type-genus: *Oestropsyche* Brauer.
Polymorphanisini; Flint, 1974: 115.

Medium to large species, wing length 8–28 mm, yellow or brownish in coloration, probably always greenish in life. Antennae usually longer than wings, occasionally up to four times fore wing length. Scape large and bulbous, pedicel narrow, ring-like. Flagellar segments numerous, up to 95 in some species, always long and narrow. Head with one or two pairs of setigerous warts on vertex; hind pair, if present, often reduced, especially in ♀. Eyes usually small, but greatly enlarged and almost meeting ventrally in ♂ of the *Polymorphanisus ocularis*-group. Mouthparts always absent, traces of palps occasionally visible. Thorax with large, shield-shaped mesoscutellum, often with black markings in the *P. nigricornis*-group. Legs often with dark tips to tibiae and femora (but not constant within species). Spurs 0.2.2, 0.3.2, 1.2.2, 1.3.2 or 1.3.3. Mesothoracic legs often greatly broadened in ♀, only slightly so (if at all) in ♂. Wing-coupling mechanism consists of one or two rows of curved macrotrichia near costa of hind wing, engaging on anal fold of fore wing. Discal and median cell usually present in fore wing; in *Oestropsyche* discal cell absent, in *Aethaloptera* 'false' discal cell produced by secondary fusion of R_{4+5}. Both cells absent in hind wing; 'false' discal cell occasionally present (though not consistent) in *Aethaloptera*. In fore wing Sc and R_1 separate, but fused for most of length in *Oestropsyche*. Cu_2 ends on wing margin in *Polymorphanisus*, but on $2A$ in other genera. In hind wing Sc and R_1 either fused (*Oestropsyche, Aethaloptera*) or R_1 ends on Sc (*P. ocularis*-group) or R_1 free (*P. nigricornis*-group); R_2 and R_3 usually separate (fused in *Polymorphanisus*).

♂ genitalia with well-sclerotized, ring-like ninth segment and one- or two-segmented, elongate gonopods. Aedeagus greatly enlarged distally, with complex internal structure. ♀ genitalia with elongate tubular ninth segment, membranous ventrally with various tubercles. Eighth sternite partially divided into two plates.

Remarks. The loss of the mouthparts is the most obvious distinguishing feature of this group; the separation of this tribe from the Macronematini is also supported by larval characters (Scott, 1975). Betten (1934) described the distinctive wing-coupling mechanism in *Macronema,* which has a single row of curved, hook-like macrotrichia along the costal margin of the hind wing. This seems to be the general pattern throughout the Macronematini, and this type is also found in *Aethaloptera*. A more advanced form is seen in *Oestropsyche* (Fig. 1) where a second row of


2
0.1mm
1
1mm
3
0.1mm
4
0.1mm
6
0.1mm
5
1mm
7
0.1mm

Figs 1–7 1–3, *Oestropsyche vitrina* ♀, wing coupling mechanism, (1) costal area of hind wing; (2) costal hair; (3) radial hair. 4, *Aethaloptera dispar* ♂, costal hair from hind wing. 5–7, *Polymorphanisus semperi* ♂, (5) costal area of hind wing; (6) costal hair; (7) radial hair.

hooked macrotrichia is present on the stem of *Rs*. In *Polymorphanisus* (Fig. 5) and *Synoestropsis* this row of macrotrichia has migrated forwards to lie anteriorly to *Rs*. Both species groups of *Polymorphanisus* are similar in this respect. The detailed structure of these macrotrichia also varies within the group. In *Aethaloptera* (Fig. 4) the hooks are toothed on the inner side, just as described in *Macronema* by Betten (1934). In *Oestropsyche* and *Polymorphanisus* the radial hooks are not toothed (Figs 3, 7) whereas the costal hairs are only slightly curved but have an enlarged, roughened tip (Figs 2, 6). In all cases the length of the macrotrichia varies according to their position on the wing. In the fore wing *2A* is greatly thickened and prominent, and the wings tend to fold along this vein, providing an attachment point for the hooks on the hind wing.

Geographical distribution

Most species of Polymorphanisini are restricted to tropical or subtropical areas. Apart from the genus *Synoestropsis*, which is endemic to South America, the tribe is represented in the Afrotropical region (sensu Crosskey & White, 1977) and Madagascar, and throughout the Indian, South East Asian, Malaysian and Indonesian regions, including the Philippines. The far eastern species *Aethaloptera sexpunctata* just reaches northern Australia. Although several species are found in southern and central China, the main exception to the broad pattern of distribution is *A. evanescens*, which occurs in the Amur Region of the U.S.S.R. and southern Siberia. A few species have very wide distributions, such as *Oestropsyche vitrina* and *Aethaloptera sexpunctata* (Fig. 46).

Biology

There is very little published information on the habitats of the Polymorphanisini, but one can infer from the existing data that larvae of many of the species inhabit fairly large rivers, not necessarily fast flowing.

Very few larvae in the group have been described. Ulmer (1912) and Barnard (1934) both described what were believed to be larvae of *Aethaloptera* spp., but these were later referred to *Macronema* (Ulmer, 1957). The larva of *A. dispar* was subsequently described by Gibbs (1973). Marlier's (1943) 'larve C de Macronematinae' was shown to be a species of *Polymorphanisus* by Ulmer (1957) and later Marlier (1958; 1961) redescribed what he believed to be the same species. Since the adults collected at the same time are *P. elisabethae*, the larvae are probably the same species, and not *bipunctatus* as Marlier believed. Scott (1975) has summarized the larval characters of these two African genera and has shown that the distinction between the Polymorphanisini and the Macronematini is supported by the larval features. Outside Africa only two other species have definitely associated larvae. These are *Aethaloptera evanescens* in the U.S.S.R., described (as *rossica*) by Lepneva (1970), and *Oestropsyche vitrina*, described by Ulmer (1957) from material from Sumatra and the Philippines.

Larvae of the neotropical genus *Synoestropsis* have been described, but not associated with any known species (Flint, 1978).

Check-list of Old World Polymorphanisini

OESTROPSYCHE Brauer
- ***vitrina*** (Hagen)
  - *palingenia* Brauer
  - *hageni* Banks **syn. n.**

AETHALOPTERA Brauer
- *Chloropsyche* McLachlan
- *Primerenca* Navás
- *Paraethaloptera* Martynov **syn. n.**

- ***dispar*** Brauer
  - *maesi* Navás
  - *maerina* Navás
- ***evanescens*** (McLachlan)
  - *rossica* Martynov **syn. n.**
- ***gracilis*** (Martynov) **comb. n.**
- ***maxima*** Ulmer
- ***sexpunctata*** (Kolenati)
  - *dyakana* Banks
  - *punctata* Banks **syn. n.**

POLYMORPHANISUS Walker
    Oestropsis Brauer

- ***nigricornis***-group
    - ***astictus*** Navás
        - *hainanensis* Martynov **syn. n.**
        - *flavipes* Banks **syn. n.**
    - ***bipunctatus*** Brauer
    - ***elisabethae*** Navás
        - *bipunctatus pupillatus* Navás **syn. n.**
    - ***fuscus*** Ulmer
    - ***hargreavesi*** **sp. n.**
    - ***marlieri*** **sp. n.**
    - ***muluensis*** **sp. n.**
    - ***nigricornis*** Walker
    - ***quadripunctatus*** Ulmer
    - ***scutellatus*** Banks
    - ***semperi*** (Brauer)
    - ***taoninus*** Navás
    - ***tumidus*** Banks
    - ***umbripes*** **sp. n.**
    - ***unipunctus*** Banks
- ***ocularis***-group
    - ***angustipennis*** Ulmer
    - ***guttatus*** Navás
    - ***ocularis*** Ulmer
        - *indicus* Banks **syn. n.**
    - ***similis*** Ulmer
        - *bisignatus* Navás **syn. n.**

Key to world genera of Polymorphanisini

1 *Rs* and *M* in fore wing connected by cross-vein (Fig. 57). (Neotropical species) . . . ***SYNOESTROPSIS***

– *Rs* and *M* not connected by cross-vein. (Old World species) 2

2 (1) 'False' discal cell present in fore wing (enclosing corneous spot) formed by secondary fusion of R_{4+5} (Fig. 19) . . . . ***AETHALOPTERA*** (p. 66)

– No 'false' discal cell (Figs 8, 47) 3

3 (2) Discal cell absent in fore wing; *Sc* and R_1 fused for most of length (Fig. 8) . . . ***OESTROPSYCHE*** (p. 64)

– Discal cell present in fore wing; *Sc* and R_1 separate (Fig. 47) ***POLYMORPHANISUS*** (p. 78)

OESTROPSYCHE Brauer

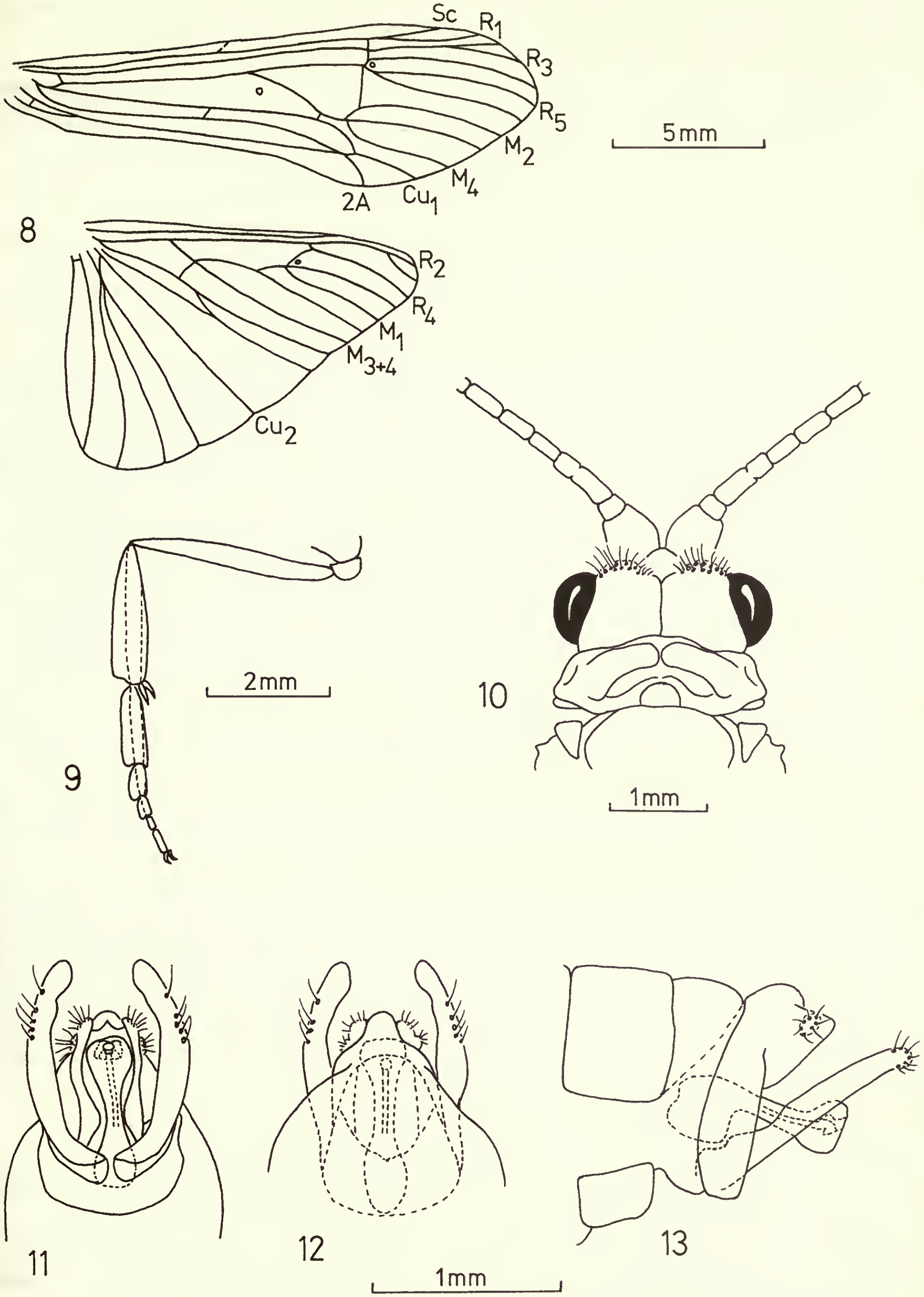
Oestropsyche Brauer, 1868: 265. Type-species: *Oestropsyche palingenia* Brauer [= *Oestropsyche vitrina* (Hagen)], by monotypy.
Oestropsyche Brauer; Ulmer, 1907: 29 [redescription].

Head with slightly raised areas anteriorly on vertex, no tubercles posteriorly (Fig. 10). Frons slightly inflated. Antennae at least twice as long as fore wing in ♂, much shorter than fore wing in ♀. Eyes small, not meeting ventrally. ♂ mesothoracic legs with tibia and tarsal segments slightly dilated (Fig. 9), markedly dilated in ♀ (Fig. 15). Spurs 1.2.2 (1.3.2 in ♂ from Philippines), not 2.3.3 as stated by most authors. Venation as in Figs 8, 14; *Sc* and R_1 fused for most of their length, discal cell absent. Median cell long and broad in ♂, smaller in ♀.

Remarks. Fischer (1963) places this monotypic genus in the Macronematini rather than the Polymorphanisini but the reason for this is not stated. The morphology of both the adults (with the loss of the mouthparts) and of the larvae (described by Ulmer, 1951) clearly show its affinities with the other genera in the Polymorphanisini.

Oestropsyche vitrina (Hagen)
(Figs 8–18)

Macronema vitrinum Hagen, 1859: 209. Holotype ♂, Sri Lanka: Rambodde (*Nietner*) (MCZ, Harvard) [not examined].
Polymorphanisus vitrinus (Hagen) Hagen, 1864: 875.
Oestropsyche palingenia Brauer, 1868: 266. LECTOTYPE ♂, Philippines: Antipolu (*Semper*) (IRSNB, Brussels), here designated [examined]. [Synonymized by Ulmer, 1907: 29; considered valid species by Banks, 1939: 56; synonymized by Ulmer, 1951: 188.]
Oestropsyche vitrina (Hagen) Ulmer, 1907: 29.


Sc
R1
R3
R5
M2
M4
Cu1
2A
5mm
8
R2
R4
M1
M3+4
Cu2
2mm
9
10
1mm
11
12
13
1mm

Figs 8–13 *Oestropsyche vitrina* ♂. 8, wing venation; 9, mid-leg; 10, head, dorsal view; 11, genitalia, ventral view; 12, genitalia, dorsal view; 13, genitalia, lateral view.

Oestropsyche hageni Banks, 1939: 56. Holotype ♂, INDIA: Mysore, Shimoga, River Tunga, 1865′ [560 m], at light, 21.vii.[? year] (*Nathan*) (type no. 23469, MCZ, Harvard) [examined]. **Syn. n.**

Macronema vitrinum Hagen; Ross, 1952: 35. [Holotype depository.]

♂. Wing length 11–17 mm. Antenna 40–46 mm with about 75 segments. Head pale brown, whitish dorsally, prothorax and tegulae whitish, rest of thorax brown. Eyes black. Abdomen blackish brown dorsally, yellowish brown ventrally. Legs yellowish. Antennae yellowish brown with darker annulations. Wings yellowish.

♀. Wing length 11–16 mm. Antennae 5–10 mm with about 35 segments; segments shorter and narrower than those of ♂. Coloration similar to ♂.

GENITALIA ♂ (Figs 11–13). Ninth tergite with projecting median lobe, gonopods short and stout, apparently unsegmented but with slight constriction distally. Well-developed lateral tubercles on tenth segment.

GENITALIA ♀ (Figs 16–18). Ninth tergite slightly bifid, eighth sternite not completely divided, each half pointed anteriorly.

REMARKS. Hagen's (1859) description of this species is based quite explicitly on a single male; Ross (1952) states that this holotype is in the MCZ, Harvard (although both Banks (1939) and Ulmer (1951) mention two males in Hagen's collection). However, Ulmer (1907; 1951) examined a 'type' in the Selys-Longchamps collection (now in the IRSNB, Brussels) and there is a further 'type' in the BMNH! I have examined these two specimens: both are labelled 'Ceylon, Nietner' and were almost certainly collected at the same time as the MCZ specimen, although presumably not seen by Hagen when he described the species. In the absence of further evidence we must accept the MCZ specimen as being the holotype; the specimens in Brussels and London therefore have no type-status, but are nevertheless important 'topotypic' material.

Banks (1939) distinguished *hageni* from *vitrina* on size and minor venational differences, but these are not constant within any one region as several authors, e.g. Ulmer (1951), have noted. Banks also described a difference in the shape of the tip of the aedeagus of his species *hageni*, but since he observed this from a posterior view, the shape depends entirely on the angle of view, as Ulmer (1951) remarked.

The larva of *vitrina* was described by Ulmer (1957: 371); its habitat in Sri Lanka was noted by Schmid (1958: 107) as 'les rivières assez agitées, en altitude moyenne, où elle est souvent commune'.

DISTRIBUTION. India (Martynov, 1935), Sri Lanka, Philippines, Sumatra, Java, Borneo, Sulawesi (Ulmer, 1951), New Guinea (Papua New Guinea), China (Navás, 1923*a*; Ulmer, 1933).

MATERIAL EXAMINED

Sri Lanka: 3 ♂ [Rambodde] (*Nietner*) (2 in BMNH, 1 in IRSNB, Brussels); 2 ♂, 3 ♀, N[awala]piti[y]a (BMNH); 1 ♂ (*Green*) (BMNH); 1 ♀, Pundaluoya, x.1897 (BMNH); 1 ♂, 1 ♀, Lindula, 3.iii.1954 (*Schmid*) (USNM, Washington); 1 ♂, Kitulgala, 2.iii.1954 (*Schmid*) (USNM, Washington); 1 ♀, Uggalkaltota, 500′ [150 m], 10–14.x.1970 (*Flint*) (USNM, Washington). **Sumatra:** 1 ♂, Sandaran Agong, Korinchi, 2450′ [740 m], v–vi.1914 (*Robinson & Kloss*) (BMNH). **Philippines:** 1 ♂, Antipolu (*Semper*) (IRSNB, Brussels) (paralectotype of *Oestropsyche palingenia* Brauer); 1 ♂, 1 ♀, Luzon, Laur, Nueva Ecija, 11–12.ii.1958 (*Thompson*) (USNM, Washington); 1 ♀, Negros, Victorias, at light, 17.vii.1928 (USNM, Washington); 1 ♂, 2 ♀, Luzon, Mt Makiling (*Baker*) (USNM, Washington). **New Guinea:** 1 ♂, 48 ♀, Papua New Guinea, Kokoda, 1200′ [360 m], vii–ix.1933 (*Cheesman*) (BMNH).

AETHALOPTERA Brauer

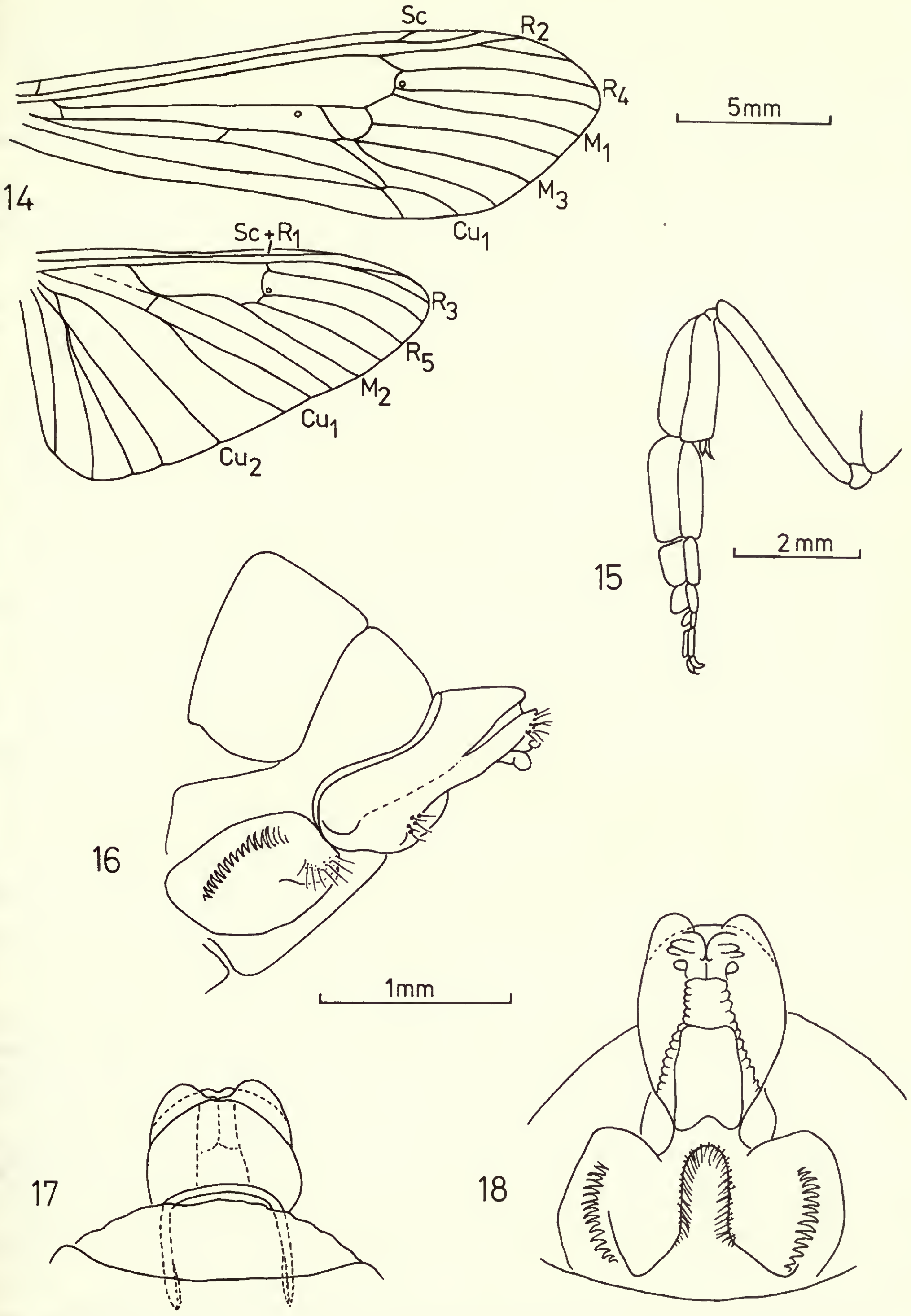
Aethaloptera Brauer, 1875: 71. Type-species: *Aethaloptera dispar* Brauer, by monotypy.

Chloropsyche McLachlan, 1880: 69. Type-species: *Chloropsyche evanescens* McLachlan, by monotypy. [Synonymized by Kimmins, 1962: 96.]

Primerenca Navás, 1915: 181. Type-species: *Primerenca maesi* Navás, by original designation and monotypy. [Synonymized by Lestage, 1919: 293.]

Paraethaloptera Martynov, 1935: 193. Type-species: *Paraethaloptera gracilis* Martynov, by original designation and monotypy. **Syn. n.**

Head with two pairs of setigerous warts on vertex in ♂ (Fig. 20), posterior pair smaller and weakly developed in ♀ (Fig. 25). Antennae up to four times wing length in ♂, only slightly longer than wing in ♀;


Sc
R2
R4
5mm
M1
14
M3
Cu1
Sc+R1
R3
R5
M2
Cu1
Cu2
15
2 mm
16
1mm
17
18

Figs 14–18 *Oestropsyche vitrina* ♀. 14, wing venation; 15, mid-leg; 16, genitalia, lateral view; 17, genitalia, dorsal view; 18, genitalia, ventral view.

antennal segments shorter and more slender in ♀. Eyes small, not meeting ventrally, slightly larger in ♀ (Figs 20, 25). ♂ mesothoracic legs with tibia and tarsal segments slightly dilated, greatly dilated in ♀ (Fig. 26). Spurs 0.2.2 or 0.3.2. Venation as in Figs 19, 24; a 'false' discal cell, enclosing the corneous spot, formed by R_4 and R_5 rejoining almost immediately after separating. ♂ wings narrow, excised on hind margin (Fig. 19), ♀ wings broader, triangular, hind margin almost straight (Fig. 24).

Most museum specimens of this group are yellowish brown in colour, with black eyes, but a specimen of *A. sexpunctata* in the BMNH bears the description, made at the time of capture by H. T. Pagden, 'Head, thorax, abdomen, legs and wing veins very pale green . . . eyes piceous.'

REMARKS. Kimmins (1962) provisionally synonymized *Paraethaloptera* with *Aethaloptera*, and despite the differences in venation I have here formally synonymized it. The female genitalia of *Paraethaloptera gracilis* (the males being unknown) are almost indistinguishable from those of *Aethaloptera maxima*.

The genus is distributed throughout the Afrotropical region, India, Sri Lanka, South East Asia and Indonesia as far as northern Australia, with one species in the Amur Region of the U.S.S.R. and southern Siberia.

Key to species of *Aethaloptera*

1	Fork R_4 in hind wing stalked (Figs 29, 33)	***maxima*** (p. 72)
–	Fork R_4 in hind wing sessile (Figs 19, 24)	2
2 (1)	Fork R_2 in fore wing slightly shorter than its stem; R_1 fuses apically with *Sc* (Fig. 39)	***gracilis*** (p. 75)
–	Fork R_2 in fore wing longer than its stem; R_1 runs free to wing margin (Fig. 24) . .	3
3 (2)	Tip of ♂ aedeagus only slightly swollen in ventral view (Fig. 23); sclerites of ♀ eighth sternite with outer posterior corners deeply excised (Fig. 27). (African species) . .	***dispar*** (p. 68)
–	Tip of ♂ aedeagus strongly swollen in ventral view (Fig. 37); sclerites of ♀ eighth sternite without deeply excised corners (Figs 38, 45). (Palaearctic and Oriental species) . .	4
4 (3)	♂ wing length 10–12 mm; posterior edges of ♀ eighth sternite straight or slightly curved (Fig. 45). (Indian, Oriental and N. Australian species)	***sexpunctata*** (p. 75)
–	♂ wing length 14–17 mm; posterior edges of ♀ eighth sternite with shallow U-shaped excision (Fig. 38). (Russian and Chinese species)	***evanescens*** (p. 72)

Aethaloptera dispar Brauer
(Figs 19–28)

Aethaloptera dispar Brauer, 1875: 72. LECTOTYPE ♂, SENEGAL: near Taoué, xi.1869 (*Steindachner*) (NM, Vienna), here designated [examined].

Primerenca maesi Navás, 1915: 182. Holotype ♀, ZAIRE: Kwamouth (*Maes*) (MRAC, Tervuren) [not examined]. [Synonymized by Lestage, 1919: 293.]

Primerenca maerina Navás, 1916: 242. [Unjustified emendation.]

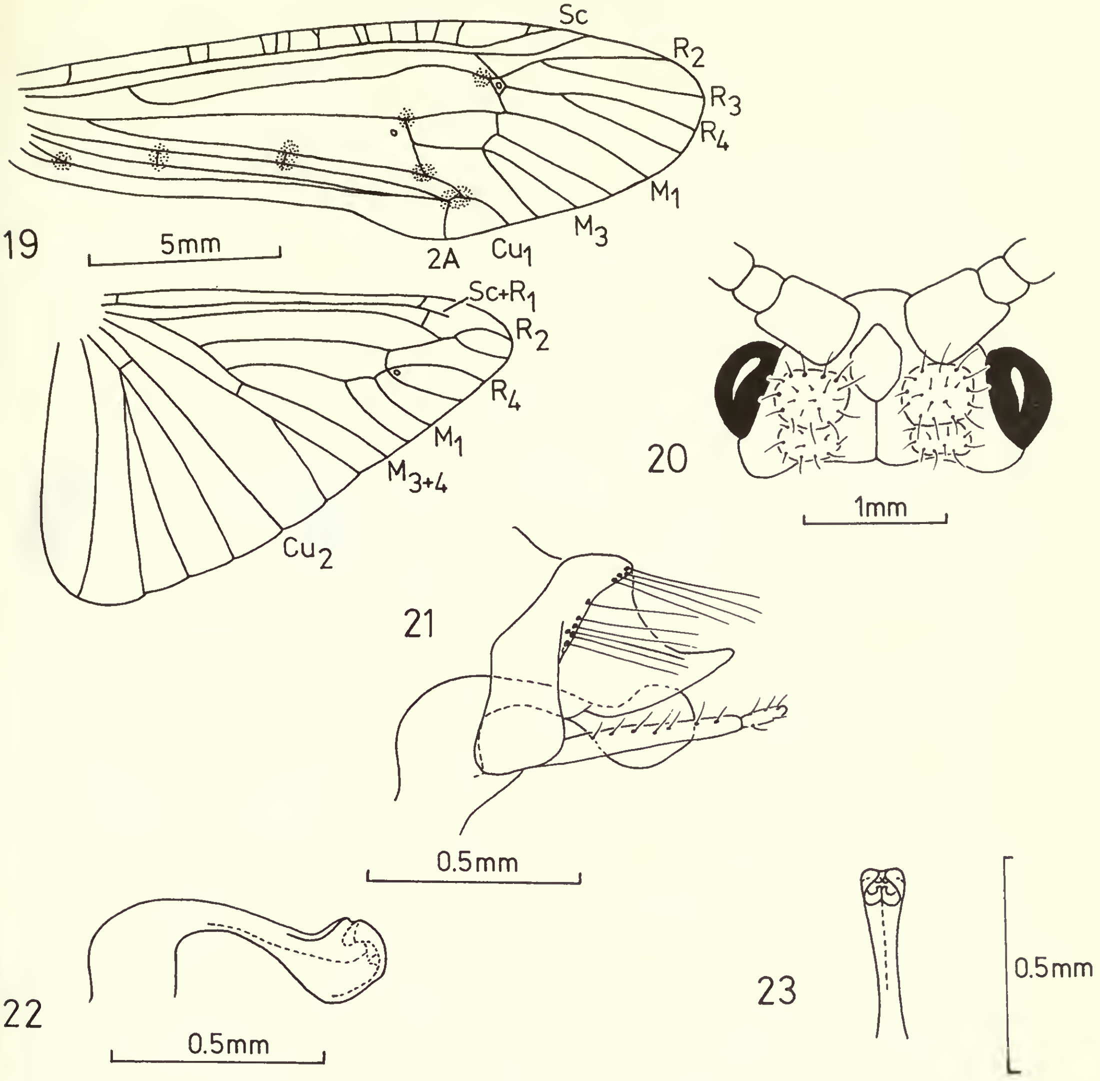
♂. Antennae up to 50 mm, with up to 95 segments. Each segment golden brown, with distinct white annular band near the base. Head and thorax yellowish brown, occasionally greenish, legs yellow, abdomen yellowish brown, darker dorsally. Wings pale green, fading to yellowish brown. Brown spots centred on various cross-veins in fore wing (Fig. 19) but these are variable in number. Wing length 10–15 mm. Spurs 0.3.2. Fork R_4 in hind wing sessile, *Sc* and R_1 in fore wing sinuous apically (Fig. 19).

♀. Antennae up to 10 mm, with 30–35 segments. Coloration as in ♂, except that basal white band on antennal segments is often ill-defined or even absent. Wings broader and shorter than in ♂; wing length 8–10 mm. Spurs and venations similar to male, except that in fore wing fork M_3 is occasionally stalked. *Sc* and R_1 in fore wing straight apically (Fig. 24).

GENITALIA ♂ (Figs 21–23). Ninth tergite slightly produced centrally. Aedeagus with angular projection on ventral surface, internal armature with broad rounded lobes in lateral view.

GENITALIA ♀ (Fig. 27). Plates of eighth sternite with outer posterior corners deeply cut away.

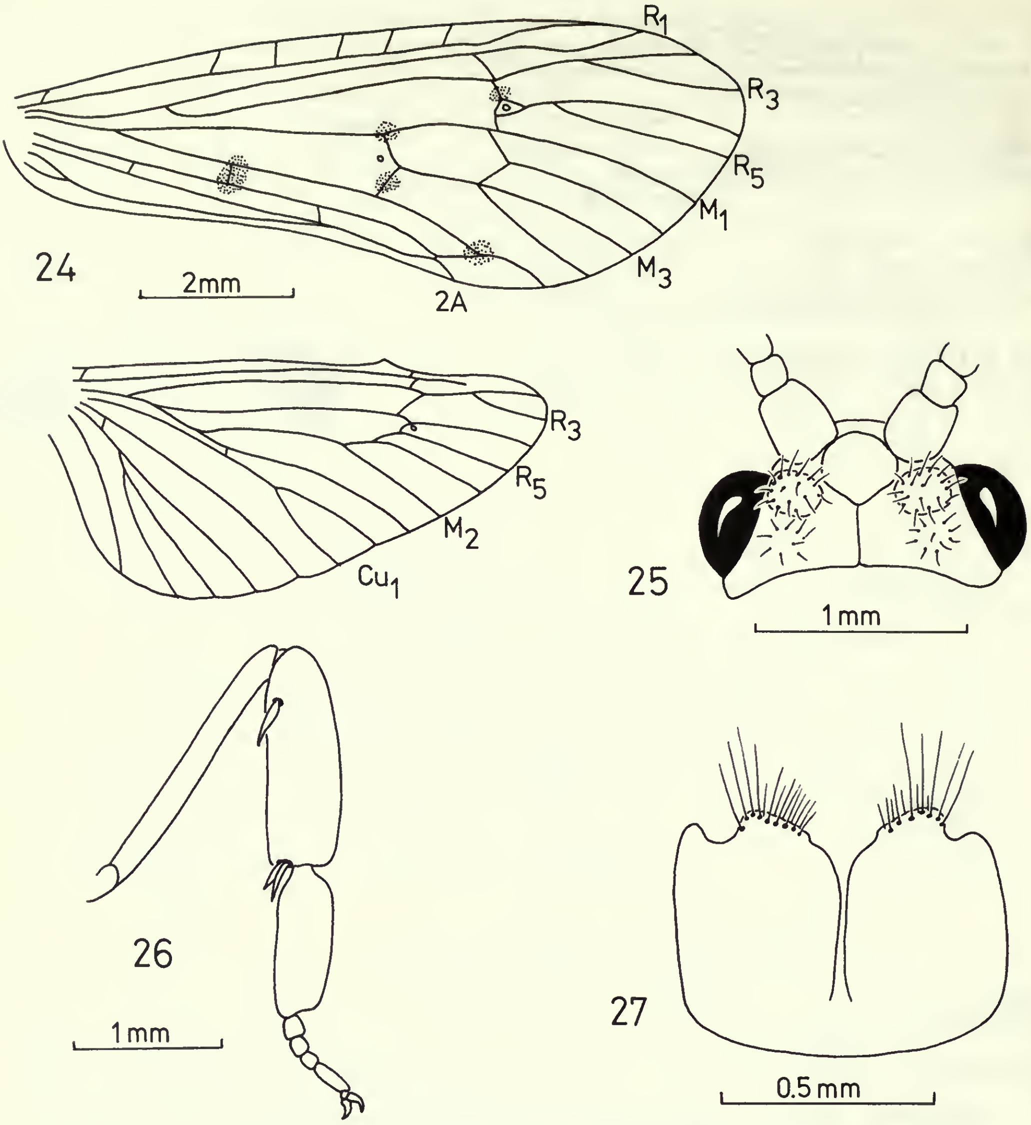
REMARKS. This is a very variable species throughout its range; this variability has prompted several authors to attempt to subdivide it. Lestage (1936) doubted that *'dispar'* was the same



Figs 19–23 *Aethaloptera dispar* ♂. 19, wing venation. 20, head, dorsal view; 21, genitalia, lateral view; 22, aedeagus, lateral view; 23, aedeagus, ventral view.

species throughout Africa, because of variation in the degree of dilation of the female tibiae, and so on. Marlier (1943) stated that there were definitely three groups in Zaire, based on differences in both male and female genitalia, the number of markings on the wings and the colour of the antennal segments. However, he declined to name these forms, although suggesting that *Primerenca maesi* Navás was a valid species. Kimmins (1962) took a rather opposite view, suggesting that not only are both *dispar* and *maxima* variable, but that they may be only local forms of one widespread species.

Only a detailed study of long series of specimens, coupled with examination of larvae from different areas, could help to solve this problem. In the present study I have examined a total of approximately 540 specimens of *dispar*, and I can find no consistent differences sufficient to split the species into discrete groups: indeed there can be as much variation between two specimens caught at the same time at one locality as between examples from the extremes of the



Figs 24–27 *Aethaloptera dispar* ♀. 24, wing venation; 25 head, dorsal view; 26, mid-leg; 27, eighth sternite, ventral view.

geographical range. *A. dispar* and *maxima* have reasonably discrete distributions; both species occur in Angola but in different river basins (see remarks on *A. maxima* below). The two species meet in Zambia at Victoria Falls, but here they can still be separated by the hind wing venation and the spur formulae; the genitalia in both sexes are very similar. Kimmins (1962) reports that males from Malawi (Nyasaland) have the typical venation and spur formula of *dispar* but have genitalia more like *maxima*.

The collection of over 200 specimens, mostly females, from Zaire (listed below) is of some interest, as they were caught at some distance from water. The collector, Dr S. L. Sutton (*in litt.*, 1978) estimates that the trapping site was about 25 km SSW. of Kindu, and 8 km east of the River Lualaba, a headwater of the Zaire River. There is another river, the Kasuku, about 3 km

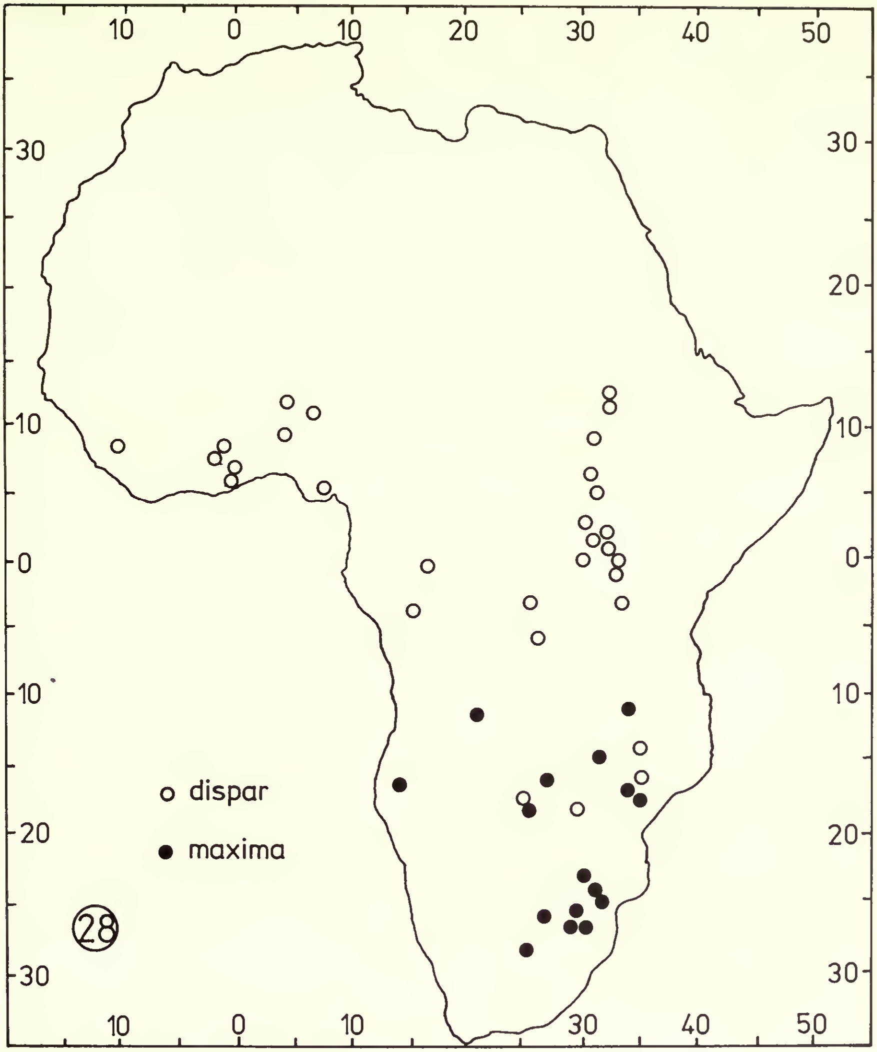


Fig. 28 Distribution map of *Aethaloptera dispar* and *A. maxima*.

to the west, but the only nearer water was a slow, shallow stream (at most 3 cm deep) about 1 km away. Fourteen other species of Trichoptera were caught at the same site.

DISTRIBUTION (Fig. 28). Senegal, Sierra Leone, Ivory Coast (Marlier, 1978), Ghana, Nigeria, Zaire, Sudan, Uganda, Tanzania, Angola (Marlier, 1965), Zambia, Malawi, Zimbabwe. Also recorded from Madagascar by Navás (1923*b*) although this is not confirmed.

MATERIAL EXAMINED

Senegal: 1 ♂, 2 ♀, near Taoué, xi.1869 (*Steindachner*) (NM, Vienna) (paralectotypes of *dispar*). **Sudan:** 4 ♂, 1 ♀, White Nile, L. Loat, 1906 (BMNH); 1 ♀, 1914 (*Lowe*) (BMNH); 2 ♀, El Jebelain, 3–4.xii.1961; 1 ♂, Renk, 4–7.xii.1961; 3 ♂, 6 ♀, Malakal–Shambe, 8.xii.1961; 1 ♂, 1 ♀, Mongalla–Malakal, 24–27.xii.1961 (*Cloudsley-Thompson*) (BMNH). **Sierra Leone:** 1 ♂, 6 ♀, Njala, 2.iv.1926, 2.vi.1926, 19–21.viii.1930, 17.iii.1932, 1.iv.1932, vi.1934 (*Hargreaves*) (BMNH). **Ghana:** 2 ♂, 1 ♀, Afram R., Mankrong, 13.ix.1950 (*Berner*) (BMNH); 2 ♀, Sunyani, 12–13.xii.1965 (*Gibbs*) (BMNH); 3 ♀, Tafo, 9–13.x.1966 (*Gibbs*) (BMNH); 6 ♂, Black Volta, 1967 (*Petr*) (BMNH). **Nigeria:** 4 ♀, Birnin Kebbi, 3.xi.1957 (BMNH); 1 ♀, Oban District, 1910 (*Talbot*) (BMNH); 11 ♀, Samaru, 18–25.v., 1–8.ix.1970 (*Ward*) (BMNH); 1 ♀, Zaria, Samaru, 26.ix.1970 (*Deeming*) (BMNH); 9 ♀, Lake Kainji, 1975 (*Bidwell*) (BMNH). **Zaire:** 2 ♂, 1900 (*Andreae*) (BMNH); 1 ♂, 4 ♀, Kabalo, v.1926 (*Schouteden*) (BMNH); 1 ♂, Gombe, 27.ii.1949 (*Marlier*) (MRAC, Tervuren); 1 ♂, Leopoldville [Kinshasa], at light, ii.1949 (*Marlier*) (MRAC, Tervuren); 1 ♂, Tshuapa, Lukolela, 13.viii. 1947 (*Poll*) (MRAC, Tervuren); 10 ♂, *c*. 200 ♀, Sciere, near Kindu, xi.1974 (*Sutton*) (BMNH). **Uganda:** 1 ♂, Lake George, xi.1920 (*Carpenter*) (BMNH); 2 ♂, Lake Albert, iii.1931 (*Hopkins*) (BMNH); 1 ♂, Jinja, iv.1952 (USNM, Washington); 2 ♂, 4 ♀, 2–24.v.1954 (*Hickin*) (BMNH); 8 ♂, 90 ♀, W. Nile, near Laropi, 27–28.iv.1956, 18 ♂, 75 ♀, Albert Nile, Pakwach, 26–29.iv.1956 (*Corbet*) (BMNH); 3 ♂, 8 ♀, Victoria Nile, L. Kyoga, near Namasale, 1.v.1956 (*Corbet*) (BMNH); 2 ♀, Kawanda, Kampala, 20–29.viii.1969 (*Brown*) (BMNH). **Tanzania:** 4 ♀, Old Shinyanga, 4.v.1954, 2–7.iii.1956 (*Burtt*) (BMNH); 1 ♀, Lake Victoria, Mwanza Pier, 11–13.viii.1956 (*Corbet*) (BMNH). **Zambia:** 12 ♂, 4 ♀, Zambezi River, Katambora, iv.1962 (*Pinhey*) (BMNH). **Malawi:** 2 ♂, Chiromo, 2.xii.1923 (*Smee*) (BMNH); 5 ♂, Ntundu, 7.viii.1952 (*Berner*) (BMNH). **Zimbabwe:** 1 ♂, Zambezi River, Victoria Falls, 9.vii.1962 (*Mason*) (AM, Grahamstown); 2 ♂, Victoria Falls, xii.1955–i.1956 (USNM, Washington); 2 ♂, 2 ♀, Victoria Falls National Park, 3–6.iv.1968 (*Spangler*) (USNM, Washington); 1 ♀, Gatooma, iv.1956 (USNM, Washington).

Aethaloptera maxima Ulmer

(Figs 28–34)

Aethaloptera maxima Ulmer, 1906: 62. NEOTYPE ♂, SOUTH AFRICA: Waterval River, National Road between Standerton and Greylingstad, 12.i.1959 (ZM, Hamburg), here designated [examined].
Chloropsyche maxima (Ulmer) Ulmer, 1907: 16.
Aethaloptera maxima Ulmer; Weidner, 1964: 66 [♂ holotype destroyed].
[*Aethaloptera dispar* Brauer, forma A; Marlier, 1965: 40. Misidentification.]

♂. Antennae up to 45 mm long, with up to 80 segments. Wing length 14–17 mm. Antennal segments golden brown, without annulations, otherwise as *A. dispar*. Spurs 0.2.2. Venation as in ♂ *dispar* except that in hind wing fork R_4 is stalked (Fig. 29).

♀. Antennae 15 mm long with approximately 45 segments. Wing length 9–15 mm. Posterior warts on head scarcely developed. Antennal segments golden brown with basal third to half white. Spurs 0.2.2. Venation as in ♀ *dispar* except that fork R_4 in hindwing is stalked (Fig. 33).

GENITALIA ♂ (Figs 30–32). Very similar to *dispar*, differing slightly in the internal armature of the aedeagus.

GENITALIA ♀ (Fig. 34). Similar to *dispar* but with the outer posterior corners of the eighth sternite less deeply excised. Kimmins (1962) discusses the differences in genitalia between *dispar* and *maxima*.

REMARKS. The relationship of this species with *A. dispar* is discussed under the latter species. Marlier (1965) recorded *maxima* from Angola as a form ('forma A') of *dispar*, but the spur formula (0.2.2) and his figure of the female genitalia show that the specimens can undoubtedly be referred to *maxima*. They were collected in eastern Angola, in the Zambezi basin, and this does not unduly extend the known distribution (Fig. 28).

DISTRIBUTION (Fig. 28). Angola (Marlier, 1965), Namibia, South Africa, Zimbabwe, Mozambique, Zambia.

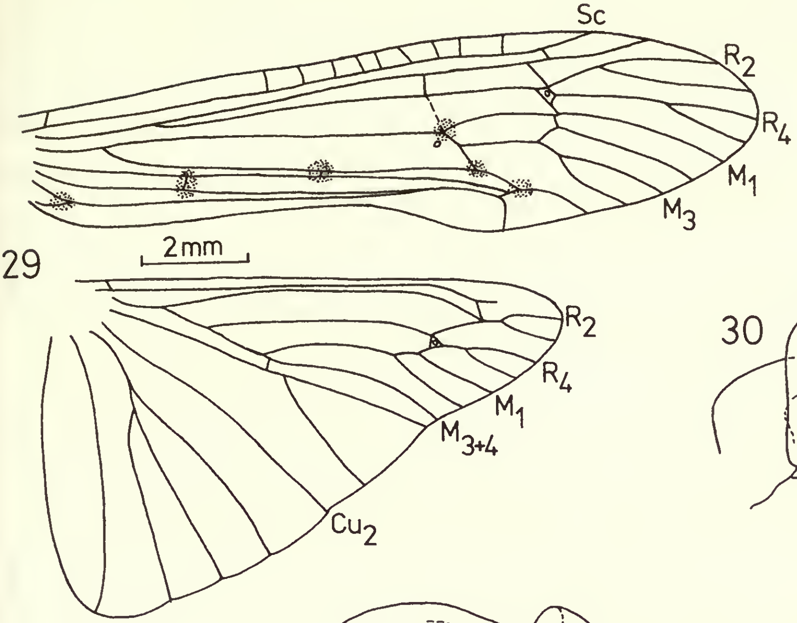
MATERIAL EXAMINED

South Africa: 2 ♂, data as neotype (BMNH); 1 ♀, Boshof, 7.i.1921 (BMNH); 2 ♀, Wilge River, Frankfort, 9.ii.1959 (BMNH); 4 ♂, 4 ♀, Transvaal, Standerton, at light, 23.iii.1960 (AM, Grahamstown); 7 ♂, 5 ♀, Frankfort, at light, 18.iii.1965 (*Chutter*) (AM, Grahamstown); 4 ♀, Kruger National Park, Olifants Camp, 19.ii.1968; 3 ♀, Pretoriuskop, 20–21.ii.1968; 1 ♀, Transvaal, Mooketsi, 14–18.ii.1968 (*Krombein & Spangler*); 2 ♀, Transvaal, Potchefstroom, 1.iii.1968 (*Spangler*) (USNM, Washington). **Namibia:** 1 ♂, 1 ♀, Otjimbumbe, Kunene River, iii. 1923 (*Barnard*) (BMNH). **Zimbabwe:** 1 ♂, Zambezi River, Victoria Falls, 9.v.1962 (*Mason*) (AM, Grahamstown). **Mozambique:** 12 ♀, Caia, Zambezi River, 29.viii.1929 (*Marshall*) (BMNH); 1 ♂, Garé, 13.vii.1929 (*Lesne*) (BMNH); 4 ♂, Nova Choupanga, near Chemba, v.1928, iv.1929 (*Lesne*) (BMNH). **Zambia:** 1 ♂, Upper Luangwa River, 27.vii.–13.viii.1910; 1 ♂, Lower Luangwa River, 4–13.ix.1910 (*Neave*) (BMNH); 19 ♂, Chipepo, from tiger fish stomachs, 25.x.1956 (BMNH).

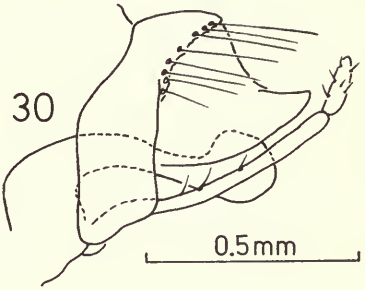
Aethaloptera evanescens (McLachlan)

(Figs 35–38)

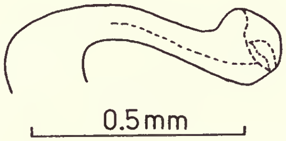
Chloropsyche evanescens McLachlan, 1880: 69. Lectotype ♂, U.S.S.R.: 'Amur Land' (*Christoph*) (BMNH), designated by Kimmins (1957: 105) [examined].


Sc
R2
R4
M1
M3
2mm
R2
R4
M1
M3+4
Cu2

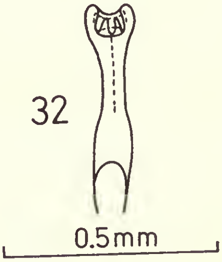
29



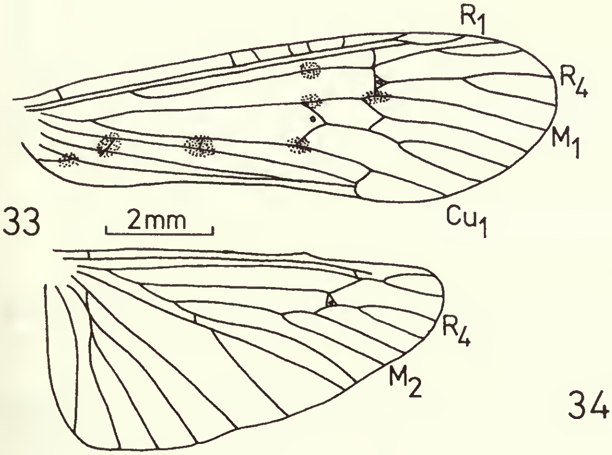
30



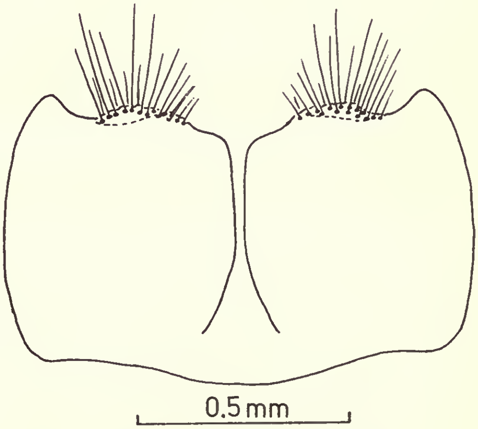
31



32

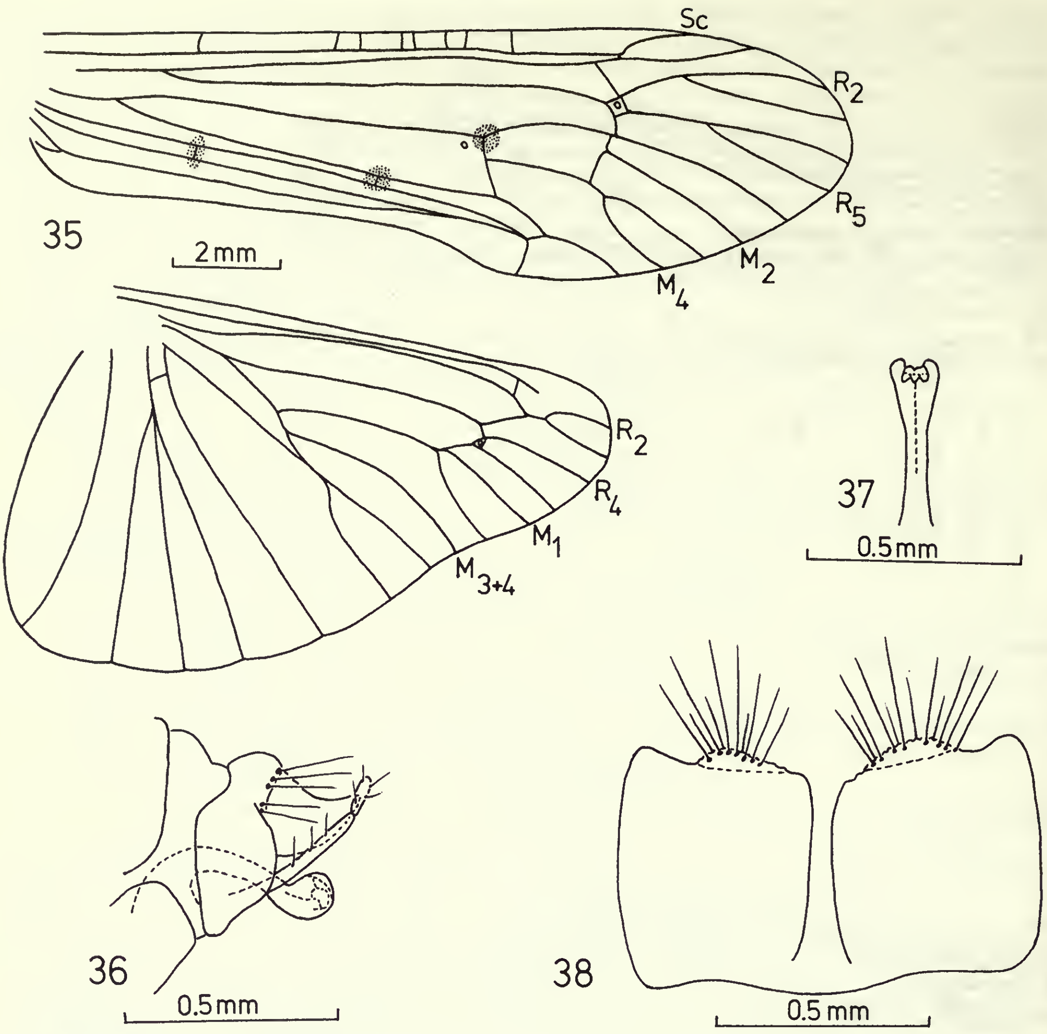

R1
R4
M1
Cu1
2mm
R4
M2

33



34

Figs 29–34 *Aethaloptera maxima*. 29, ♂ wing venation; 30, ♂ genitalia, lateral view; 31, aedeagus, lateral view; 32, aedeagus, ventral view; 33, ♀ wing venation; 34, ♀ eighth sternite, ventral view.



Figs 35–38 *Aethaloptera evanescens.* 35, ♂ wing venation; 36, ♂ genitalia, lateral view; 37, aedeagus, ventral view; 38, ♀ eighth sternite, ventral view.

Aethaloptera rossica Martynov, 1910: 385. Syntypes ♂, ♀, U.S.S.R.: 'Ussurian Amur Land and S. Siberia to River Ob'' (? ZI Leningrad) [not examined]. **Syn. n.**
Aethaloptera evanescens (McLachlan) Kimmins, 1962: 96.

♂. Antennae up to 40 mm long, with approximately 75 segments. Wing length 14–17 mm. Antennal segments golden brown with basal third white. Head and thorax yellowish brown, legs pale yellow. Abdomen yellowish brown ventrally, slightly darker dorsally. Usually three brown spots on fore wing (Fig. 35) but these may be reduced in number or absent. Spurs 0.2.2. or 0.3.2. Venation as in *A. dispar* (Fig. 35).

♀. Antennae 10–12 mm long, with up to 40 segments. Wing length 10 mm. Coloration and spurs as ♂, venation as in ♀ *dispar*.

Genitalia ♂ (Figs 36, 37). Ninth segment very narrow ventrally, gonopods slender. In ventral view, aedeagus strongly enlarged apically with square-edged excision.

Genitalia ♀ (Fig. 38). Eighth sternite with a shallow U-shaped excision at the outer posterior corners.

Remarks. Martynov (1934: 305) suspected that his species *rossica* was a synonym of *evanescens*, as it was only separable by the spur formula, which was then considered a generic character to separate *Aethaloptera* and *Chloropsyche*. Kimmins (1962) has synonymized these genera as the spur formula is unreliable, so the synonymy of the two species is inevitable. I have not examined the Martynov types, which are presumably in the ZI, Leningrad, but the series in the BMNH from the Rivers Ob' and Ussuri were determined as *rossica* by Martynov. An examination of this series showed that the pre-apical spur of the mesothoracic leg varied from being very long to very short, and was absent in two specimens, thus emphasizing the variability of this character.

DISTRIBUTION. U.S.S.R. (Amur Region, S. Siberia), S. and E. China.

MATERIAL EXAMINED

China: 1 ♂, 1 ♀, Fu-chou (*Yang*); 1 ♂, Pai-se, Kwangsi, 29.iii.1939 (*Richardson*). **U.S.S.R.: 3** ♂, Amur Region, Raddefka [= Radde, on Amur River]; 4 ♂, River Ob', Tomsk, 6.vii.1925 (*Filipjev*); 2 ♂, R. Ussuri, Bikin, 9.vii.1927 (*Martynov*). (All specimens in BMNH.)

Aethaloptera gracilis (Martynov) **comb. n.**
(Figs 39, 40)

Paraethaloptera gracilis Martynov, 1935: 193. 4 ♀ syntypes, INDIA: Sanjai River, Chakradharpur, Chota Nagpur, 8–10.ii.1918 (*Annandale & Gravely*) (IM, Calcutta) [not examined].

♂. Unknown

♀. Antennae up to 10 mm long, with about 35 segments. Wing length 8–10 mm. Antennal segments golden brown, proximal half yellowish white. Head, thorax and abdomen yellowish brown, legs yellow. Wings yellowish brown with up to four brown spots (Fig. 39) which may be reduced or absent. In fore wing, fork R_2 is shorter than its stalk; in both wings R_1 fuses apically with Sc (Fig. 39). Spurs 0.2.2.

GENITALIA ♀ (Fig. 40). Eighth sternite with a moderately deep excision on the outer posterior corners.

REMARKS. I was unable to borrow the syntypes of this species, but Martynov's (1935) figures of the distinctive venation make it instantly recognizable. Because of the similar distribution, it is possible that *gracilis* specimens are dimorphic females of *sexpunctata*, but the peculiar venation makes this unlikely.

DISTRIBUTION. India, Sri Lanka.

MATERIAL EXAMINED

India: 1 ♀, Alagar Kovil, Madura District, 17.iii.1936 (BMNH); 1 ♀, New Delhi, at light, 29.xi.1967 (*Gibson*) (USNM, Washington). **Sri Lanka:** 1 ♀, Uggalkaltota, 350′ [105 m], 31.i–8.ii.1970; 2 ♀, Sigiriya, 800′ [240 m], 25.ii.1970 (*Davis & Rowe*) (USNM, Washington).

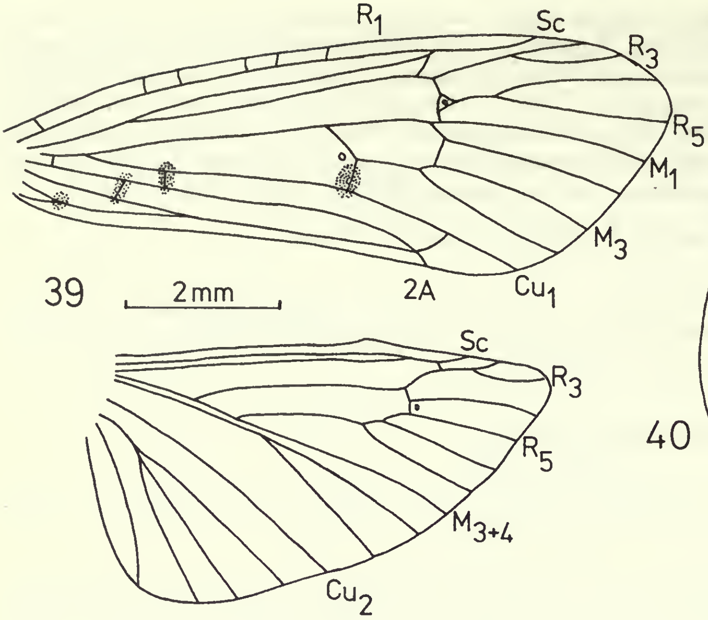
Aethaloptera sexpunctata (Kolenati)
(Figs 41–46)

Setodes sexpunctata Kolenati, 1859: 266. Holotype ♂, INDIA (*Hügel*) (NM, Vienna) [examined].
Polymorphanisus sexpunctatus (Kolenati) Brauer, 1868: 263.
Aethaloptera sexpunctata (Kolenati) Ulmer, 1907: 19.
Aethaloptera dyakana Banks, 1920: 354. Holotype ♀, BORNEO: Duson Timoc, v.1882 (*Grabowsky*) (type no. 10885, MCZ, Harvard) [examined]. [Synonymized by Ulmer, 1951: 194.]
Paraethaloptera punctata Banks, 1938: 232. LECTOTYPE ♀, WEST MALAYSIA: Negri Sembilan, Port Dickson, 10.i.1935 (*Pendlebury*) (BMNH), here designated [examined]. **Syn. n.**
Aethaloptera punctata (Banks) Kimmins, 1962: 96.

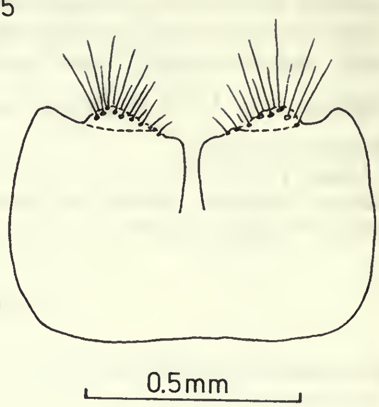
♂. Antennae up to 35 mm long, with about 70 segments. Wing length 10–12 mm. Antennal segments golden brown with proximal third white. Head, thorax and abdomen yellowish brown, legs pale yellow. Wings greenish or yellowish, with up to seven brown spots (Fig. 41). Spurs 0.3.2.

♀. Antennae 10 mm long, with about 40 segments. Wing length 8–11 mm. Coloration as in ♂. Spurs 0.3.2.

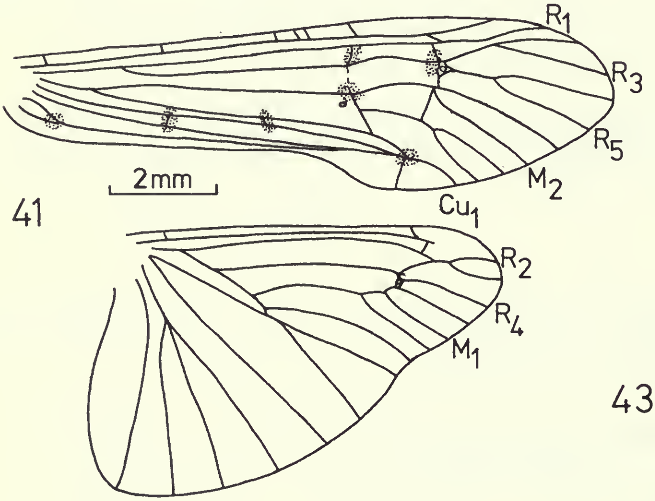
GENITALIA ♂ (Figs 42–44). Aedeagus greatly expanded in ventral view to form two rounded lobes with a flatter lobe between.


R_1
Sc
R_3
R_5
M_1
M_3
2A
Cu_1
2mm
Sc
R_3
R_5
M_{3+4}
Cu_2

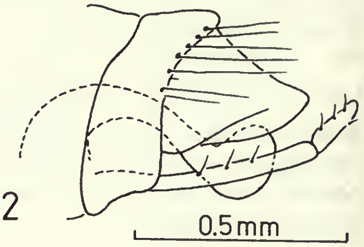
39



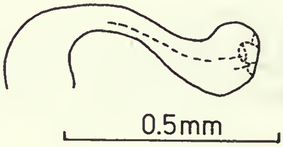
40


R_1
R_3
R_5
2mm
M_2
Cu_1
R_2
R_4
M_1

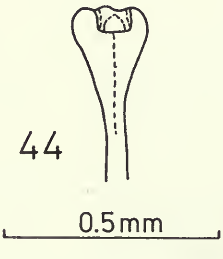
41



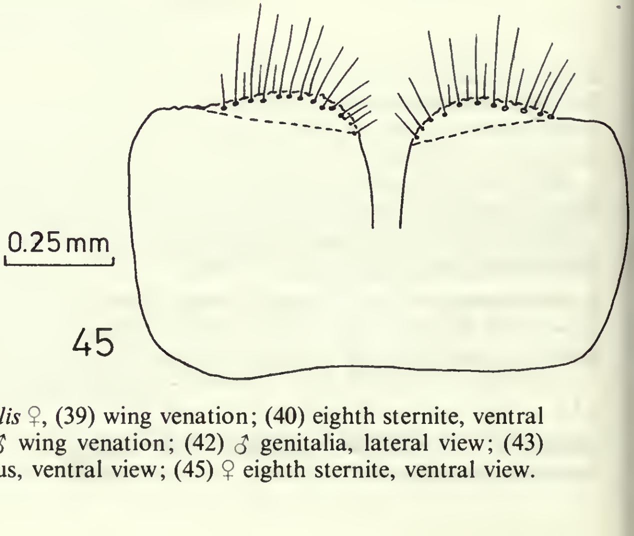
42



43



44



45

Figs 39–45 39, 40, *Aethaloptera gracilis* ♀, (39) wing venation; (40) eighth sternite, ventral view. 41–45, *A. sexpunctata,* (41) ♂ wing venation; (42) ♂ genitalia, lateral view; (43) aedeagus, lateral view; (44) aedeagus, ventral view; (45) ♀ eighth sternite, ventral view.

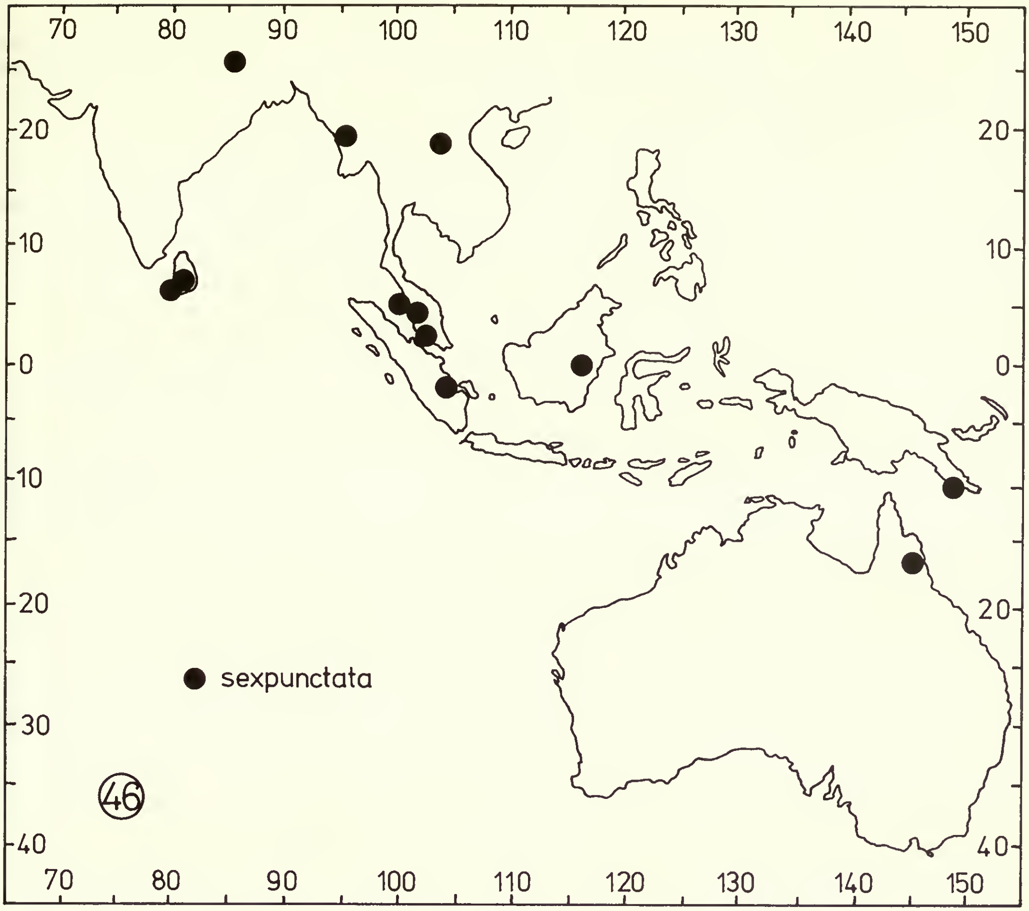


Fig. 46 Distribution map of *Aethaloptera sexpunctata*.

Genitalia ♀ (Fig. 45). Posterior margin of each half of eighth sternite almost straight, slightly serrated towards mid-line.

Remarks. In his original description, Kolenati (1859) described the presence of brown spots on the posterior cubitus, arculus and thyridium, making six spots on the two fore wings combined, hence the specific name *sexpunctata*. As described above, most specimens have more spots, often up to seven, on each wing. The male holotype does in fact have four spots on each wing; Kolenati apparently overlooked the anal spot.

Kimmins's (1962) 'type' of *punctata* Banks is so labelled by Banks but is not distinguished in his description. This specimen is therefore designated the lectotype. Banks (1938) also refers to specimens from Selangor, Kuala Lumpur, but the location of this material is unknown; these would be further paralectotypes (the two females from this locality in the BMNH do not agree with the dates cited by Banks). Other specimens from Port Dickson in the BMNH were determined by Banks as *sexpunctata*, thus supporting the synonymy.

The discovery of *A. sexpunctata* in N. Queensland is the first record of the tribe Polymorphanisini in Australia.

Distribution (Fig. 46). India, Sri Lanka, Burma, Laos, Cambodia (Ulmer, 1926), West Malaysia, Sumatra (Ulmer, 1951), Borneo (Ulmer, 1930), New Guinea, Australia (Queensland).

MATERIAL EXAMINED

India: 2 ♂, NW. India (*Horne*) (BMNH); 14 ♂, Bihar, Pusa, various dates and collectors (BMNH). **Sri Lanka:** 1 ♂, Maha Oya, 12.iii.1954 (*Schmid*) (USNM, Washington); 2 ♂, Hasalaka, 1000′ [300 m], at light, 30–31.iii.1973 (*Baumann & Cross*) (USNM, Washington). **Burma:** 9 ♂, Prome, at light, 17–18. ii.1918 (BMNH). **Laos:** 1 ♂, Pakkading, 4.v.1932 (*Kerr*) (BMNH).

West Malaysia: 2 ♀, Penang, Tanjong Bungah, at light, 11.iv.1955 (*Pagden*); 1 ♀, Lahat, 1916 (*Henderson*); 2 ♀, Selangor, Kuala Lumpur, at light, 9.ii., 30.ix.1931 (*Pendlebury*); 5 ♀, Negri Sembilan, Port Dickson, various dates (*Pendlebury*); 1 ♀, data as lectotype (paralectotype of *punctata* Banks). **New Guinea:** 1 ♀, Papua New Guinea, Port Moresby, 1887 (*Kowald*). (All specimens in BMNH.)

Australia: 1 ♀, Queensland, 20 miles [32 km] W. of Tully, 20. iv.1964 (*Common & Upton*) (BMNH) [first record for Australia].

POLYMORPHANISUS Walker

Polymorphanisus Walker, 1852: 78. Type-species: *Polymorphanisus nigricornis* Walker, by monotypy.
Oestropsis Brauer, 1868: 263. Type-species: *Oestropsis semperi* Brauer, by monotypy. [Synonymized by Ulmer, 1907: 19.]

Head with one pair of setigerous warts on vertex with a transverse ridge posteriorly on each side (Fig. 52). Antennae up to twice wing length, similar in both sexes. Mesothoracic legs of ♂ with tibia and tarsal segments slightly broadened, very broad in ♀. Spurs 1.3.2, 1.3.3 or 2.3.3. Venation as in Figs 47, 120; Sc and R_1 in fore wing terminate separately on wing margin. In hind wing of *ocularis*-group R_1 ends on Sc; R_{2+3} fused.

REMARKS. It is possible that future work will show that the two species groups of *Polymorphanisus* deserve generic status. The *ocularis*-group particularly has many derived characters such as the enlarged male eyes, the unsegmented gonopods, and so on. However, there are also several features which unit the two groups, particularly venational characters and the unusual wing-coupling mechanism. Further larval descriptions will probably elucidate the relationship of the two groups as at present the larvae of the *ocularis*-group are unknown.

The genus is distributed throughout the Afrotropical region, and from India through south East Asia to Indonesia, including the Philippines.

Key to species of *Polymorphanisus*

1		In fore wing M_1 is closely associated at base with R_5; M_2 is direct continuation of M_{1+2} stem (Fig. 47). ♂ eyes well separated ventrally. (***nigricornis***-group)	2
–		In fore wing M_1 is direct continuation of M_{1+2} stem; M_2 arises from median cell (Fig. 120). ♂ eyes almost touching ventrally (Fig. 122). (***ocularis***-group)	16
2	(1)	African species	3
–		Asian species	6
3	(2)	Thorax unmarked	4
–		Thorax with two spots on mesoscutellum (Figs 58–71)	5
4	(3)	Antennal flagellum dark brown or black, with dark stripe on scape (Fig. 75)	***hargreavesi*** (p. 87)
–		Antennae yellow	***marlieri*** (p. 87)
5	(3)	Mesoscutellar spots small and round (Fig. 48). Antennae brown in ♂, black in ♀	***bipunctatus*** (p. 81)
–		Mesoscutellar spots elongate (Figs 58–71). Antennae yellow	***elisabethae*** (p. 81)
6	(2)	Thorax unmarked	7
–		Thorax with one or more dark spots	9
7	(6)	Fork R_2 in fore wing shorter than its stalk (Fig. 110)	***taoninus*** (p. 95)
–		Fork R_2 longer than or equal to its stalk (Fig. 111)	8
8	(7)	Antennae, fore femora and tibiae pale yellowish brown (basal antennal segments sometimes with a narrow, longitudinal, dark brown stripe)	***astictus*** (p. 79)
–		Antennae, fore femora and tibiae dark brown	***umbripes*** (p. 95)
9	(6)	Mesoscutellum unmarked. Two large spots anteriorly on mesoscutum and two on metascutum (Fig. 94)	***quadripunctatus*** (p. 90)
–		Mesoscutellum with one, two or four spots	10
10	(9)	Two spots on mesoscutellum (Fig. 105)	11

– One or four spots on mesoscutellum (Figs 85, 87, 118) 14

11 (10) Thoracic spots large and oval, meeting sides of mesoscutellum (Fig. 102) . ***scutellatus*** (p. 92)

– Thoracic spots not touching sides of mesoscutellum (Fig. 105) 12

12 (11) Head greatly swollen anteriorly (Fig. 112). Mesoscutellar spots narrow and elongate, widened posteriorly . . . . ***tumidus*** (p. 95)

– Head not swollen. Mesoscutellar spots not widened posteriorly 13

13 (12) Mesoscutellar spots elongate (Fig. 105). ♂ fore wings falcate (Fig. 104) . . ***semperi*** (p. 92)

– Mesoscutellar spots small and round (Fig. 91). ♂ fore wings not falcate . . ***nigricornis*** (p. 90)

14 (10) Thorax with single spot in centre of mesoscutellum (Fig. 118). . . . ***unipunctus*** (p. 96)

– Thorax with more than one spot (Figs 85, 87). 15

15 (14) Wings dark brown. Thorax with one large spot on mesoscutellum and two smaller squarish spots anteriorly on metascutum (Fig. 85) . . . . ***fuscus*** (p. 84)

– Wings pale yellowish brown or greenish. Mesoscutellum with four small round spots (Fig. 87) . . . . ***muluensis*** (p. 87)

16 (1) Fore wing with no brown spots . . . . ***angustipennis*** (p. 98)

– Fore wing with one or two brown spots (Figs 131, 133) 17

17 (16) Fore wing with only one spot (Fig. 133) . . . . ***guttatus*** (p. 98)

– Fore wing with two spots (Fig. 131) 18

18 (17) ♂ gonopods abruptly narrowed half-way (Fig. 129). Outer posterior corners of ♀ eighth sternite sloping evenly towards outer edge (Fig. 132). (African species) . . ***similis*** (p. 103)

– ♂ gonopods slightly widened in centre (Fig. 136). Outer posterior corners of ♀ eighth sternite produced in rounded lobes (Fig. 138). (Indian and Oriental species) . ***ocularis*** (p. 100)

The *nigricornis*-group

Dark green or yellowish brown species, often with black markings on thorax. Wings long and narrow, without brown markings (except *P. fuscus*). Antennae about twice forewing length. Eyes small, well separated ventrally in male. Spurs usually 1.3.3, in some species 1.3.2. In fore wing M_2 is direct continuation of M_{1+2} stem; in hind wing R_1 terminates on wing margin. ♂ gonopods long and slender, terminal segment well defined.

Polymorphanisus astictus Navás
(Figs 79–83)

Polymorphanisus astictus Navás, 1923*a*: 47. LECTOTYPE ♂, CHINA: Kweichow, P'ing-Fa, 1908 (*Cavalerie*) (MNHN, Paris), here designated [examined].

Polymorphanisus hainanensis Martynov, 1930: 82. Holotype ♂, CHINA: Hainan Tao I., Mt Wuchih Shan, 20.v.1903 (BMNH) [examined]. **Syn. n.**

Polymorphanisus flavipes Banks, 1939: 53. Holotype ♀, INDIA: Mysore, Shimoga, River Tunga, 1865′ [560 m], at light, 10.vi.[? year] (*Nathan*) (type no. 23467, MCZ, Harvard) [examined]. **Syn. n.**

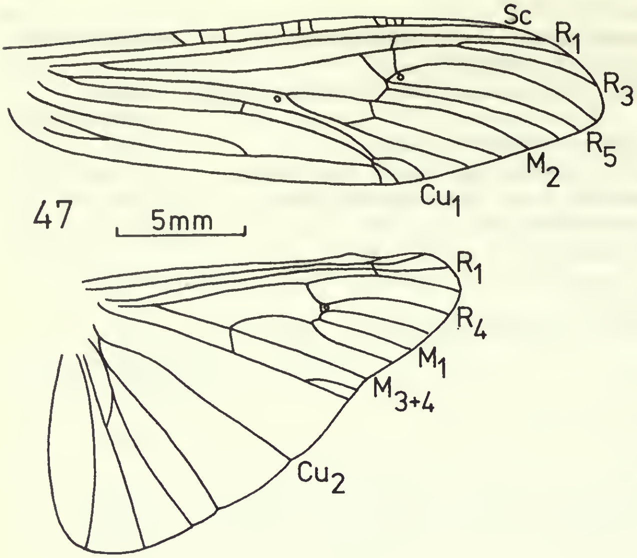
♂. Antennae up to 45 mm, with about 65 segments. Antennal segments yellow, basally brown, distal segments yellowish brown. Body yellowish brown, wings pale greenish yellow or yellowish brown. No markings on thorax. Wing length 19–23 mm, venation as in Fig. 79. Spurs 1.3.3.

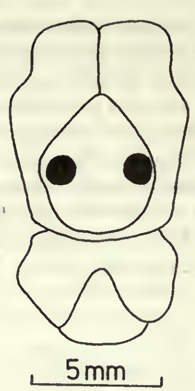
♀. Antennae up to 50 mm, with up to 80 segments. Scape, pedicel and first flagellar segment sometimes with thin black stripe externally, but all segments may be yellow as in ♂. General coloration as ♂. Wing length 18–28 mm. Spurs 1.3.3.

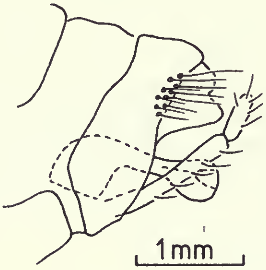
GENITALIA ♂ (Figs 80–82). Gonopods long and narrow. Ninth segment produced into a spatulate lobe, viewed dorsally. Aedeagus with swollen round tip, with small, oval cavity at tip.

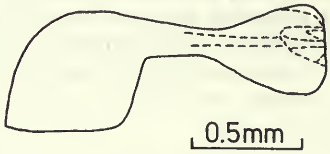
GENITALIA ♀ (Fig. 83). Outer posterior corners of eighth sternite slightly produced as rounded lobes; outer margins of sternite slightly sinuate.

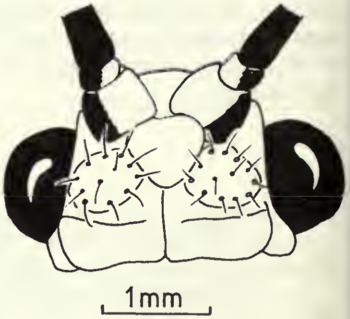
REMARKS. Banks (1939) seems to have confused this species with some of its allies. He erroneously states that it belongs in the *indicus-ocularis* group; Ulmer (1951: 178) has pointed out that this is incorrect. In the same paper Banks described *flavipes*, comparing it with what he believed to be Walker's species *nigricornis*, but he was misled by Walker's failure to notice the mesoscutellar markings (see *umbripes*, p. 95). Banks also noted two specimens of *flavipes* with yellowish wings and black spots each side of the mesonotum. I have examined all of Banks's material of this species; the two specimens with yellow wings are males of *flavipes* (i.e. *astictus*)

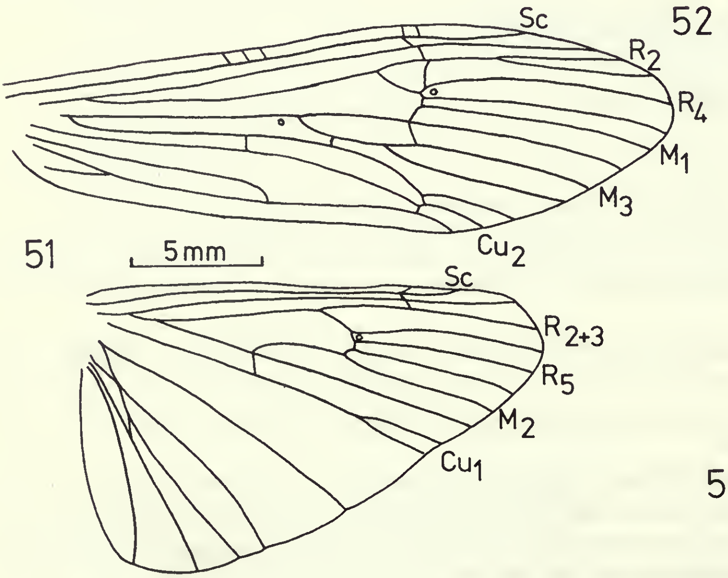

47
Sc
R1
R3
R5
M2
Cu1
5mm
R1
R4
M1
M3+4
Cu2

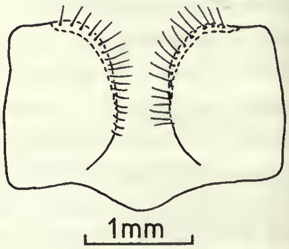

48


49


50


52


51
Sc
R2
R4
M1
M3
Cu2
5mm
Sc
R2+3
R5
M2
Cu1


53

Figs 47–53 *Polymorphanisus bipunctatus*. 47, ♂ wing venation; 48, ♂ thorax; 49, ♂ genitalia, lateral view; 50, aedeagus, lateral view; 51, ♀ wing venation; 52, ♀ head, dorsal view; 53, ♀ eighth sternite, ventral view.

but the two with 'black' markings are females with the normal yellowish brown wing colour. The markings are simply abnormally dark attachment points of the flight muscles showing through the mesonotum.

Distribution. India (Mysore), China, Thailand, West Malaysia.

Material examined

India: 3 ♂, 34 ♀, data as holotype of *flavipes*, various dates; 12 ♀, Mysore, Bhadravati (*Nathan*). (All specimens in MCZ, Harvard: all apparently paratypes of *flavipes* but not labelled as such.) **China:** 1 ♂, Hainan Tao I., Mt Wuchih Shan, 12.v.1903 (paratype of *hainanensis*). **Thailand:** 1 ♂, Upper Pran R., 14.iv.1926 (*Ladell*). **West Malaysia:** 1 ♂, Pahang, Kuala, Tahan, at light, 300′ [90 m], 23.xi.1921 (*Pendlebury*); 1 ♀, Kedah, nr Jitra, 5.iv.1928 (*Pendlebury*); 1 ♀, Selangor, Ulu Langat, at light, 31.viii.1934 (*Pendlebury*). (All specimens in BMNH.)

Polymorphanisus bipunctatus (Brauer)
(Figs 47–53, 72)

Oestropsis bipunctatus Brauer, 1875: 73. LECTOTYPE ♀, Ethiopia: Beni Sciangul, Blue Nile, 1871 (*Marno*) (NM, Vienna), here designated [examined].
Polymorphanisus bipunctatus (Brauer) Ulmer, 1907: 20.

♂. Antennae up to 40 mm, with up to about 70 segments. Scape and pedicel yellowish brown, flagellar segments brown with dark annulation at each joint. Body colour yellowish brown. Thorax with one pair of round black spots on mesoscutellum (Fig. 48). Wings pale green, fading to yellowish brown. Wing length 22–26 mm. Venation as in Fig. 47. Spurs 1.3.3.

♀. As ♂, except as follows. Scape and pedicel of antennae with black longitudinal stripe on outer side, flagellum black (Fig. 52). Wing length 20–28 mm. Venation as in Fig. 51. Spurs 1.3.3, occasionally 2.3.3.

Genitalia ♂ (Figs 49, 50). Terminal segment of gonopod short and wide. Ratio of lengths of basal segment of gonopod to terminal segment 2.6–2.9:1. Ninth segment relatively broad ventrally, rounded dorsally.

Genitalia ♀ (Fig. 53). Inner posterior corners of eighth sternite strongly rounded; thickened edges extending almost half-way along inner side. Outer corners almost right-angled.

Remarks. Betten & Mosely (1940) regarded this species as almost certainly a synonym of *nigricornis*. In view of the widely differing distribution it would seem best to regard them as separate, at least until their larvae have been described (the same would apply to *ocularis* and *similis* in the *ocularis*-group). *P. bipunctatus* can be separated from *nigricornis* by the relative lengths of the segments of the gonopods.

The Angolan specimen listed below is presumably from the south or east of that country, in the Zambezi basin (cf. *Aethaloptera maxima*, p. 72).

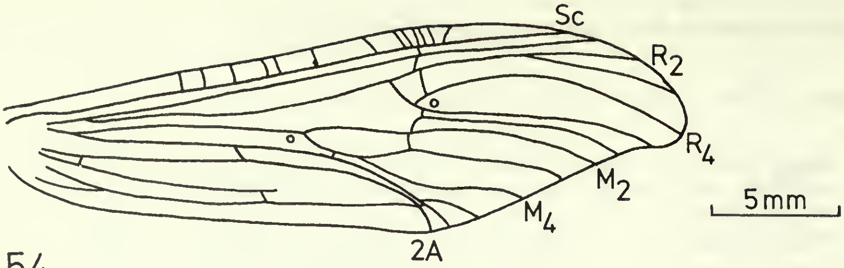
Distribution (Fig. 72). Sudan, Ethiopia, Kenya, Angola, Zimbabwe, South Africa.

Material examined

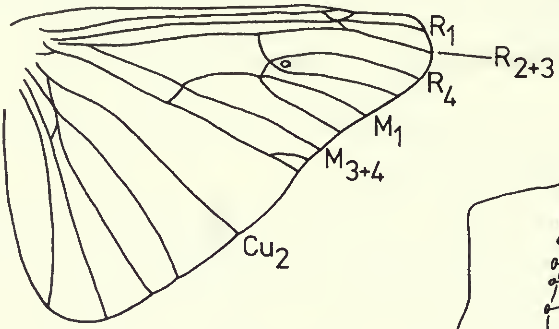
Sudan: 1 ♂, Senga [Singa], Blue Nile, 30.xii.1914 (*Lowe*); 1 ♂, Zeidab, 15.xi.1918 (*Bedford*); 1 ♀, Shendi, 31.x.1928 (*Cowland*); 2 ♂, nr mouth of Dinder River, Blue Nile, 26.vii.1909 (*Flower*); 1 ♂, White Nile. (All specimens in BMNH.) **Ethiopia:** 1 ♀ paralectotype, data as lectotype (NM, Vienna). **Kenya:** 2 ♀, Nzoia River, Lwamba Ferry, 19–20.iv.1956 (*Corbet*) (BMNH). **Angola:** 1 ♀ (BMNH). **Zimbabwe:** 1 ♂, Victoria Falls, i.1956 (USNM, Washington). **South Africa:** 1 ♀, Transvaal, Elandshoek, at light, 16.xi.1946 (*Capener*) (BMNH); 3 ♀, Natal, Ndumu Reserve, 1–10.xii.1963; 1 ♂, Natal, Tugela River, 9.x.1953; 4 ♀, Natal, Mooi River, 20.xii.1940 (*Crass*) (AM, Grahamstown).

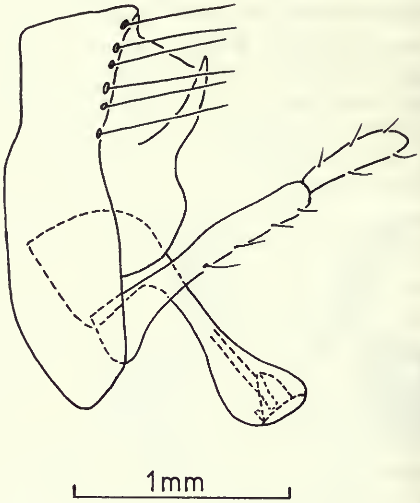
Polymorphanisus elisabethae Navás
(Figs 54–56, 58–72)

Polymorphanisus elisabethae Navás, 1931*a*: 140. Holotype ♀ [not ♂, as stated by Navás], Zaire: Malela, viii.1928 (*Queen Elisabeth*) (MRAC, Tervuren) [examined].
Polymorphanisus bipunctatus pupillatus Navás, 1931*a*: 139. Holotype ♂, Zaire: Bokote, 22.xii.1925 (*Hulstaert*) (MRAC, Tervuren) [examined]. **Syn. n.**
[*Polymorphanisus bipunctatus* (Brauer) Marlier, 1961: 208. Misidentification.]
Polymorphanisus pupillatus Navás; Marlier, 1965: 77.
[*Polymorphanisus bipunctatus* (Brauer); Marlier, 1965: 40. Misidentification.]

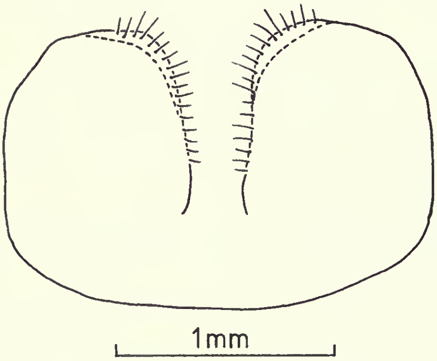

Sc
R2
R4
M2
M4
2A
5mm

54

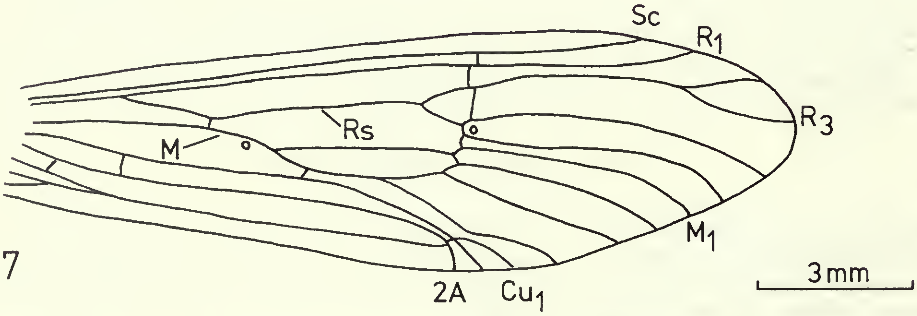

R1
R2+3
R4
M1
M3+4
Cu2



55

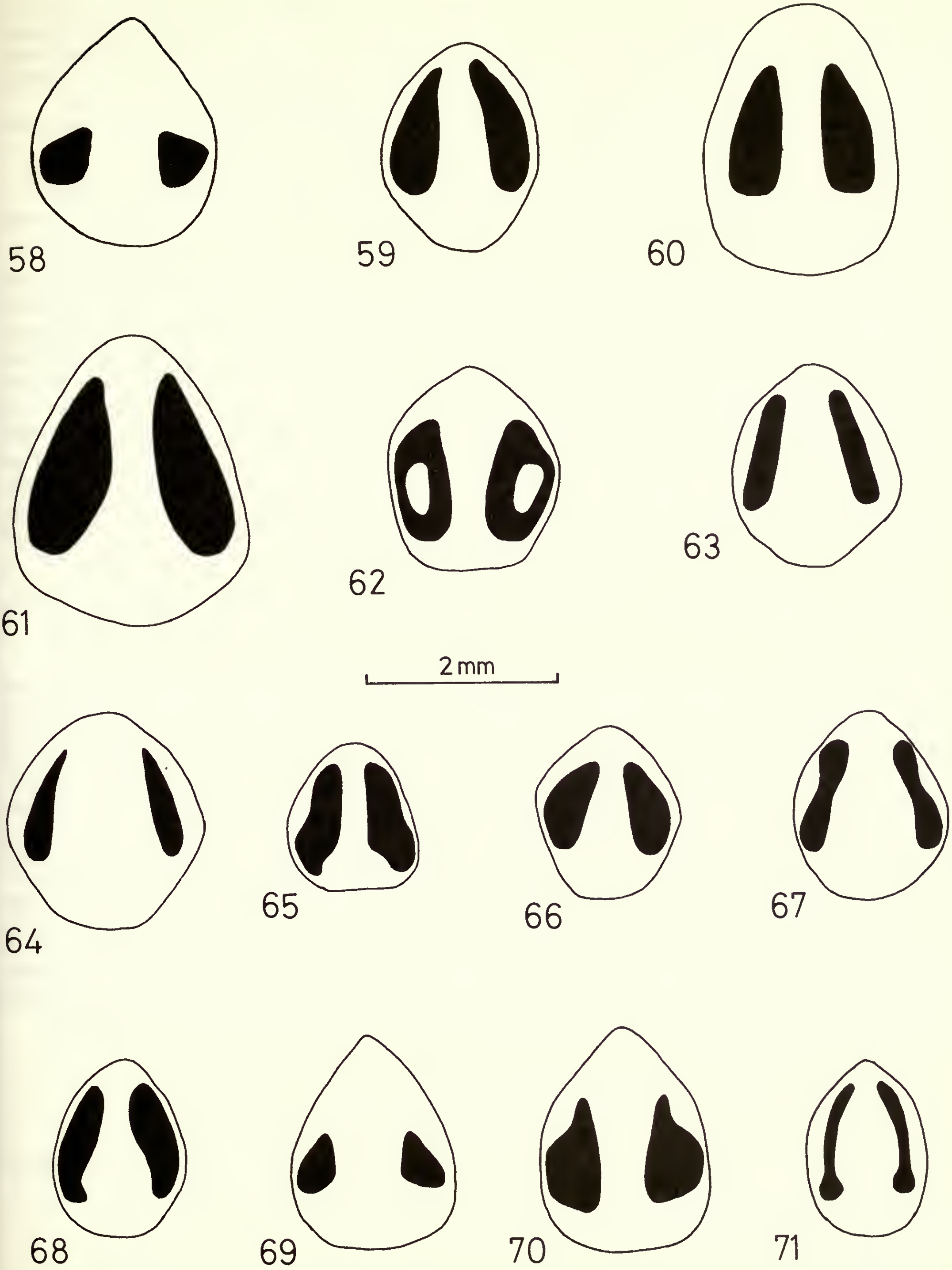


56


Sc
R1
R3
Rs
M
M1
2A
Cu1
3mm

57

Figs 54–57 54–56, *Polymorphanisus elisabethae*, (54) ♂ wing venation; (55) ♂ genitalia, lateral view; (56) ♀ eighth sternite, ventral view. 57, *Synoestropsis* sp. ♂ fore wing.


58
59
60
61
62
63
2 mm
64
65
66
67
68
69
70
71

Figs 58–71 Variation in thoracic markings of *Polymorphanisus elisabethae*. 58, ♀, Zaire, Kivu; 59, ♂, Albertville; 60, ♂, Sierra Leone; 61, ♀ holotype of *elisabethae*; 62, ♂ holotype of *pupillatus*; 63, ♀, Zaire, Popokabaka; 64–66, ♀, Ibembo; 67, ♀, Kivu; 68, ♀, Lulonga; 69, 70, ♀, ♂, Bilomba; 71, ♀, Zambia.

♂. Antennae up to 70 mm, with up to 75 segments. Scape and pedicel yellowish brown, flagellar segments golden brown, with a dark line at each joint. Body yellowish brown, abdomen darker brown dorsally. Thorax with a pair of elongate spots, varying greatly (Figs 58–71; ♂, ♀) but never round. Wing length 15–26 mm. Wings slightly falcate (Fig. 54), pale green to yellowish brown, with golden brown streaks apically along the branches of *R* and *M*; extreme wing tip often dark brown. Spurs 1.3.3 or 2.3.3.

♀. Antennae up to 45 mm, otherwise as ♂. Wings less obviously falcate than in ♂, being shorter and broader. Wing length 16–20 mm. Spurs 1.3.3 or 2.3.3.

GENITALIA ♂ (Fig. 55). Similar to *bipunctatus*, armature of aedeagus with enlarged external opening.

GENITALIA ♀ (Fig. 56). Outer corners of eighth sternite rounded; inner thickened edges extending less than half-way.

REMARKS. This species has caused great confusion to previous authors on account of its great variability, as well as being confused with *bipunctatus*. Navás (1931*a*: 139) described the variety *pupillatus* as a form of *bipunctatus*, not realizing that it was a form of his own species *elisabethae* described in the same paper! Lestage (1936) recognized that all variations in the form of the thoracic spots could occur, including their disappearance, and Barnard (1934) made similar comments about *bipunctatus* (in the present paper forms lacking thoracic markings are recognized as valid species). Marlier (1965) took an opposite view, grouping specimens with similar markings into 'forms' of *bipunctatus*. These are in fact forms of *elisabethae*, and Figs 58–71 show the enormous variability of these thoracic markings, even in specimens from the same locality. I do not think that there is any possibility of subdividing this species in any meaningful way, and even Navás's *pupillatus* is here considered to fall within the range of variation, despite Marlier's (1965) elevation of it to a full species.

DISTRIBUTION (Fig. 72). Sierra Leone, Ghana, Nigeria, Cameroun, Congo (Marlier, 1965), Zaire, Uganda, Zambia, Zimbabwe.

MATERIAL EXAMINED

Sierra Leone: 5 ♂, 11 ♀, Njala, various dates (*Hargreaves*) (BMNH). **Ghana:** 1 ♀, Wassaw District, 45 miles [72 km] inland from Sekondi (BMNH). **Nigeria:** 1 ♀, Lagos, 6 miles [9.6 km] NW. of Agege, at light, 24.ii.1973 (*Riley*) (BMNH); 1 ♀, Kagoro Forest, 15–17.x.1971 (*Deeming*) (BMNH); 2 ♀, Benin, 8.iv.1973 (*Medler*) (BMNH). **Cameroun:** 1 ♀ (*Rosevear*) (BMNH). **Zaire:** 1 ♀, 150–200 miles [240–320 km] W. of Kambove, 3500–4000′ [1050–1200 m], 28.ix.1907 (*Neave*) (BMNH); 1 ♀, Tshuapa, Bamania, x.1951 (*Hulstaert*); 3 ♀, Uele, Ibembo, 30.vi.1950, x–xi.1951, ii.1952 (*Hutsebaut*); 1 ♂, Albertville [Kalemie], 3.i.1919 (*Mayne*); 1 ♀, Mayumbe forest, 29.iii.1973 (*Allaer*); 1 ♀, Kivu, Lubero 950 m, xii.1956 (*Célis*); 1 ♀, Mayumbe, Vaku, 22.v.1970 (*Elsen*); 1 ♀, Kimwenza, ix.1962 (*Deheegher*); 1 ♀, Kwango, Popokabaka, iii.1952 (*Pierquin*); 1 ♀, Lulonga, 22.ii.1949 (*Marlier*); 1 ♀, Irangi, River Luhoho, 8–10.i.1957 (*Leleup*), 2 ♀, 24.xii.1957 (*Marlier*); 1 ♀, 1 ♂, Bilomba, Kamituga, 25.viii.1950 (*Marlier*); 2 ♀, Bolobo–Lukolela, 10.vi.1951 (*Marlier*); 1 ♂, Mombongo, 29.vi.1951 (*Marlier*); 2 ♀, Kisangani, 1.vii.1951 (*Marlier*); 1 ♂, Meko, Bolobo, nr Tshumbiri, 9.vi.1951 (*Marlier*); 5 ♂, 1 ♀, Lukanga, at light, 7.vi.1955 (*Marlier*); 1 ♂, Ikela, ix.1959 (*Leleup*); 1 ♀, Shabunda, Kiamiseke, at light, 27.x.1954 (*Leleup*) (all in MRAC, Tervuren). **Uganda:** 3 ♂, 1 ♀, Karuma Falls, Victoria Nile (*Corbet*) (BMNH). **Zambia:** 2 ♀, Katombora, Zambezi River, iv.1962 (*Pinhey*) (BMNH). **Zimbabwe:** 1 ♂, 1 ♀, Victoria Falls, i.1956 (USNM, Washington).

Polymorphanisus fuscus (Ulmer)
(Figs 84–86)

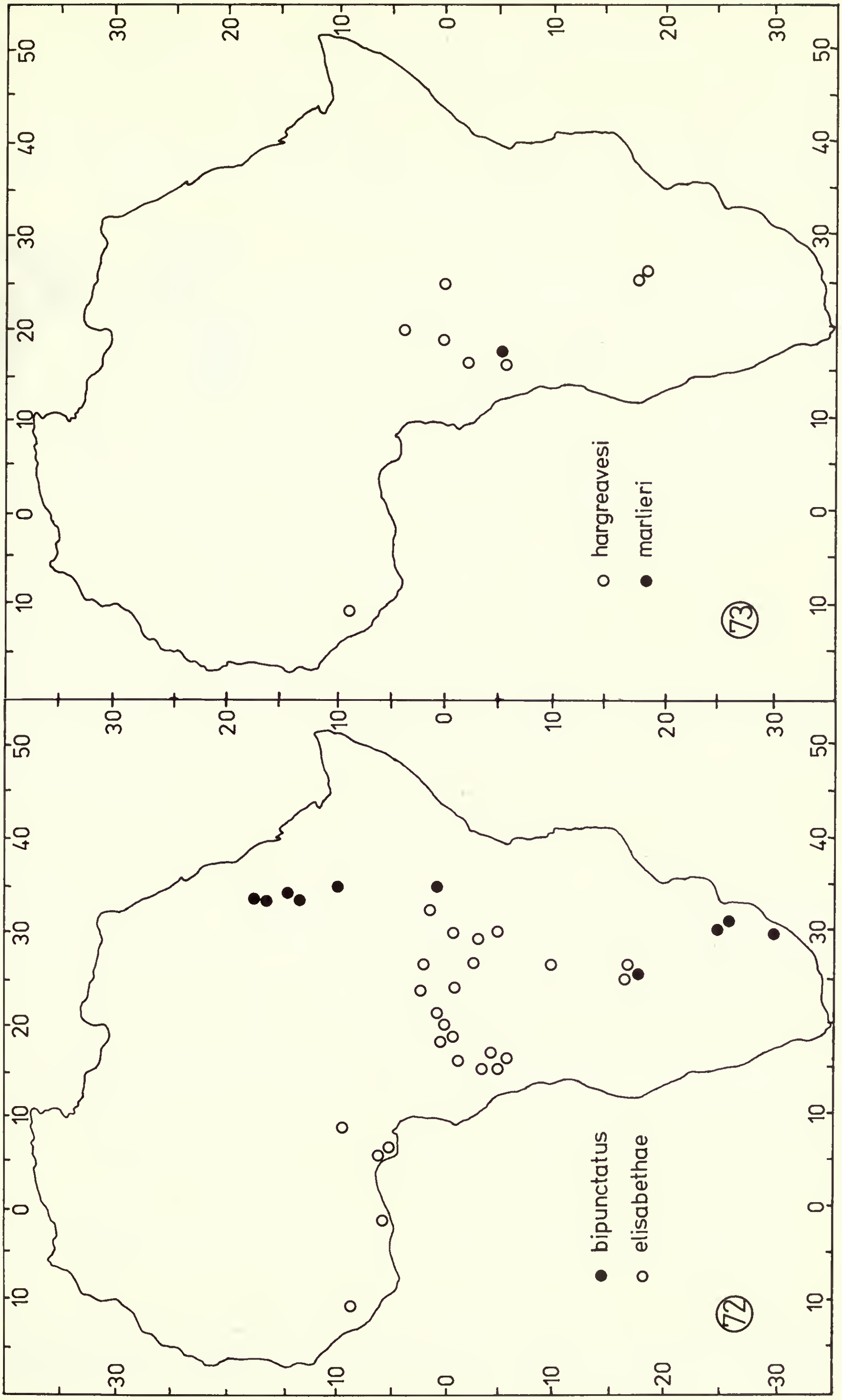
Oestropsis fusca Ulmer, 1905*a*: 42. Holotype ♀, SUMATRA: Soekaranda [? Soekaradja] (*Dohrn*) (type no. 1753, IZPAN, Warsaw) [examined].

Polymorphanisus fuscus (Ulmer) Ulmer, 1905*b*: 31.

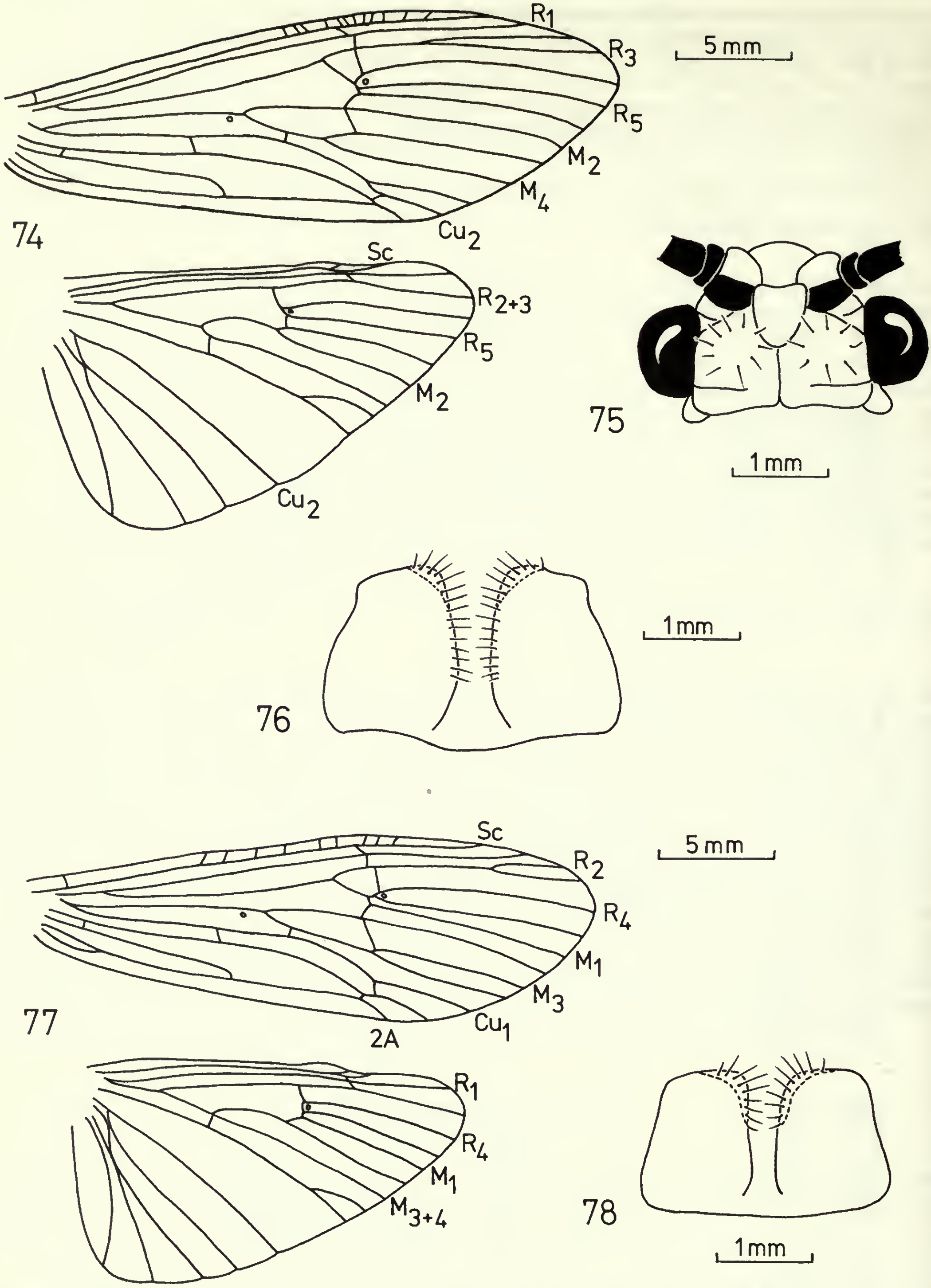
Oestropsis fusca Ulmer; Tomaszewski, 1961: 4. [Holotype depository.]

♂. Unknown.

♀. Antennal length unknown (all specimens damaged). Antennal segments golden brown, with dark joints. Body pale yellowish brown. Thorax with two oblong, black markings on mesonotum; mesoscutellum almost covered by large oval spot (Fig. 85). Wings dark smoky brown with blackish brown spot near base of costa on fore wing (Fig. 84). Wing length 24–26 mm. Spurs 1.3.3.


72
● bipunctatus
○ elisabethae
73
○ hargreavesi
● marlieri
10
0
10
20
30
40
50
30
20
10
0
10
20
30

Figs 72, 73 Distribution maps. 72, *Polymorphanisus bipunctatus* and *P. elisabethae*; 73, *P. hargreavesi* and *P. marlieri.*


R1
R3
5 mm
R5
M2
M4
Cu2
74
Sc
R2+3
R5
M2
Cu2
75
1 mm
76
1 mm
Sc
R2
5 mm
R4
M1
M3
Cu1
2A
77
R1
R4
M1
M3+4
78
1 mm

Figs 74–78 74–76, *Polymorphanisus hargreavesi* ♀, (74) wing venation; (75) head, dorsal view; (76) eighth sternite, ventral view. 77, 78 *P. marlieri* ♀, (77) wing venation; (78) eighth sternite, ventral view.

GENITALIA ♀ (Fig. 86). Sides of eighth sternite tapering posteriorly, outer corners broadly rounded.

REMARKS. Even though the male is unknown, this species is one of the most distinctive of the genus, with its characteristic dark brown wings and the markings on the thorax and wing base.

DISTRIBUTION. Sumatra, Borneo (Sarawak).

MATERIAL EXAMINED

Borneo: 4 ♀, Sarawak, Gunong Mulu National Park, at light, ii–iii.1978 (*Holloway et al.*) (BMNH).

Polymorphanisus hargreavesi sp. n.

(Figs 73–76)

♂. Unknown.

♀. Antennae up to 45 mm, with about 65 segments. Scape yellowish brown, with longitudinal black stripe (Fig. 75), pedicel and flagellum dark brown or black. Body yellowish brown, abdomen dark brown dorsally, wings pale yellowish brown. No markings on thorax. Wing length 22–28 mm. Venation as in Fig. 74. Spurs 1.3.3.

GENITALIA ♀ (Fig. 76). Outer posterior corners of eighth sternite produced into sharp points.

REMARKS. This species is readily distinguished from *bipunctatus* and *elisabethae* by the lack of thoracic markings, and from *marlieri* by the dark antennae. The specimens examined show a discontinuous distribution, with a long series from Sierra Leone, and scattered individuals from Zaire, Zambia and Zimbabwe. Although I am reasonably certain of the identity of these latter specimens, I am restricting the type-series to the Sierra Leone material.

DISTRIBUTION (Fig. 73). Sierra Leone, Zaire, Zambia, Zimbabwe.

MATERIAL EXAMINED

Holotype ♀, **Sierra Leone:** Njala, 22.x.1930 (*Hargreaves*) (BMNH).

Paratypes. 11 ♀, data as holotype, various dates (BMNH).

Material excluded from paratype series. **Zaire:** 1 ♀, 1926 (*Jackson*) (BMNH); 2 ♀, Lulonga, 22.ii.1949 (*Marlier*); 1 ♀, Ubangi, 11.viii.1947 (*Poll*); 3 ♀, Kwango, Popokabaka, iii.1952 (*Pierquin*); 1 ♀, Bolobo, 27.vii.1930 (*Beheyu*); 1 ♀, Zaire River, Is. Kui, Stanleyville [Kisangani], 1.vii.1951 (*Marlier*); 1 ♀, Meko, Bolobo, 9.vi.1951 (*Marlier*); all in MRAC, Tervuren. **Zambia:** 1 ♀, Katombora, iv.1962 (USNM, Washington). **Zimbabwe:** 1 ♀, Victoria Falls, xii.1938 (USNM, Washington).

Polymorphanisus marlieri sp. n.

(Figs 73, 77, 78)

♂. Unknown.

♀. Antennae 45 mm long, with approximately 75 segments. Antennal segments pale yellow, with brown annulations at joints. Body and wings yellowish brown, no markings on thorax. Wing length 22, 26 mm (two specimens only). Venation as in Fig. 77, fork R_2 in fore wing shorter than, or just equal in length to, stem. Spurs 1.3.3.

GENITALIA ♀ (Fig. 78). Outer corners of eighth sternite rounded, outer sides slightly sinuous.

REMARKS. This species is named after Dr G. Marlier in recognition of his valuable work on the African Trichopteran fauna. The lack of thoracic markings and the pale antennae distinguish it from other African species, its nearest relative probably being *hargreavesi* sp. n., with dark antennae.

DISTRIBUTION. (Fig. 73). Zaire.

MATERIAL EXAMINED

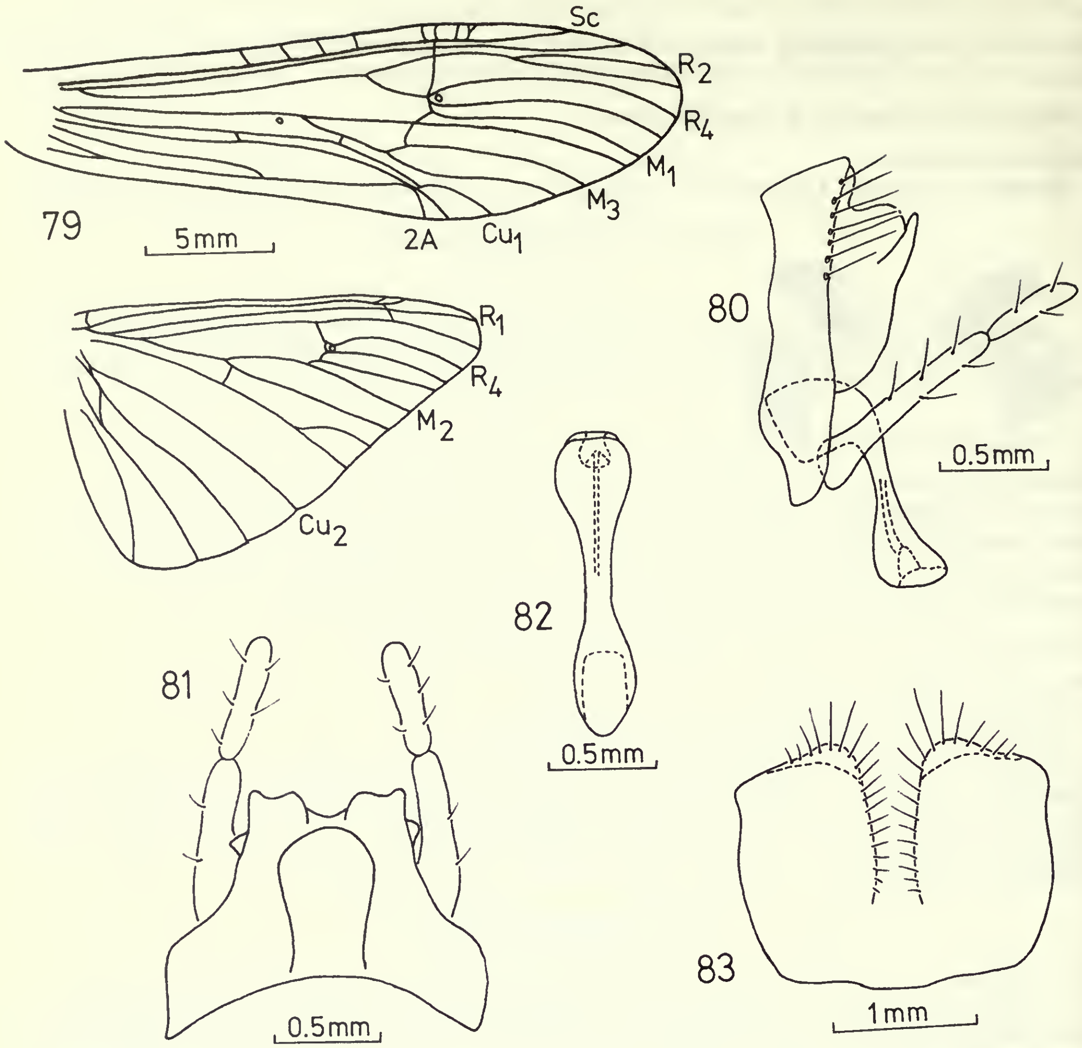
Holotype ♀, **Zaire:** Feshi, Kwango, R. Kwenge, iv.1959 (*Leleup*) (MRAC, Tervuren).

Paratype. **Zaire:** 1 ♀, Feshi, R. Kwenge, 850 m, at light, ii.1959 (*Leleup*) (BMNH).

Polymorphanisus muluensis sp. n.

(Figs 87–90)

♂. Antennae 40 mm long, with up to 70 segments. Antennal segments pale golden yellow, with dark brown joints. Body yellowish brown, thorax with two pairs of black markings on the mesoscutellum, the anterior



Figs 79–83 *Polymorphanisus astictus.* 79, ♂ wing venation; 80, ♂ genitalia, lateral view; 81, ♂ genitalia, dorsal view; 82, aedeagus, ventral view; 83, ♀ eighth sternite, ventral view.

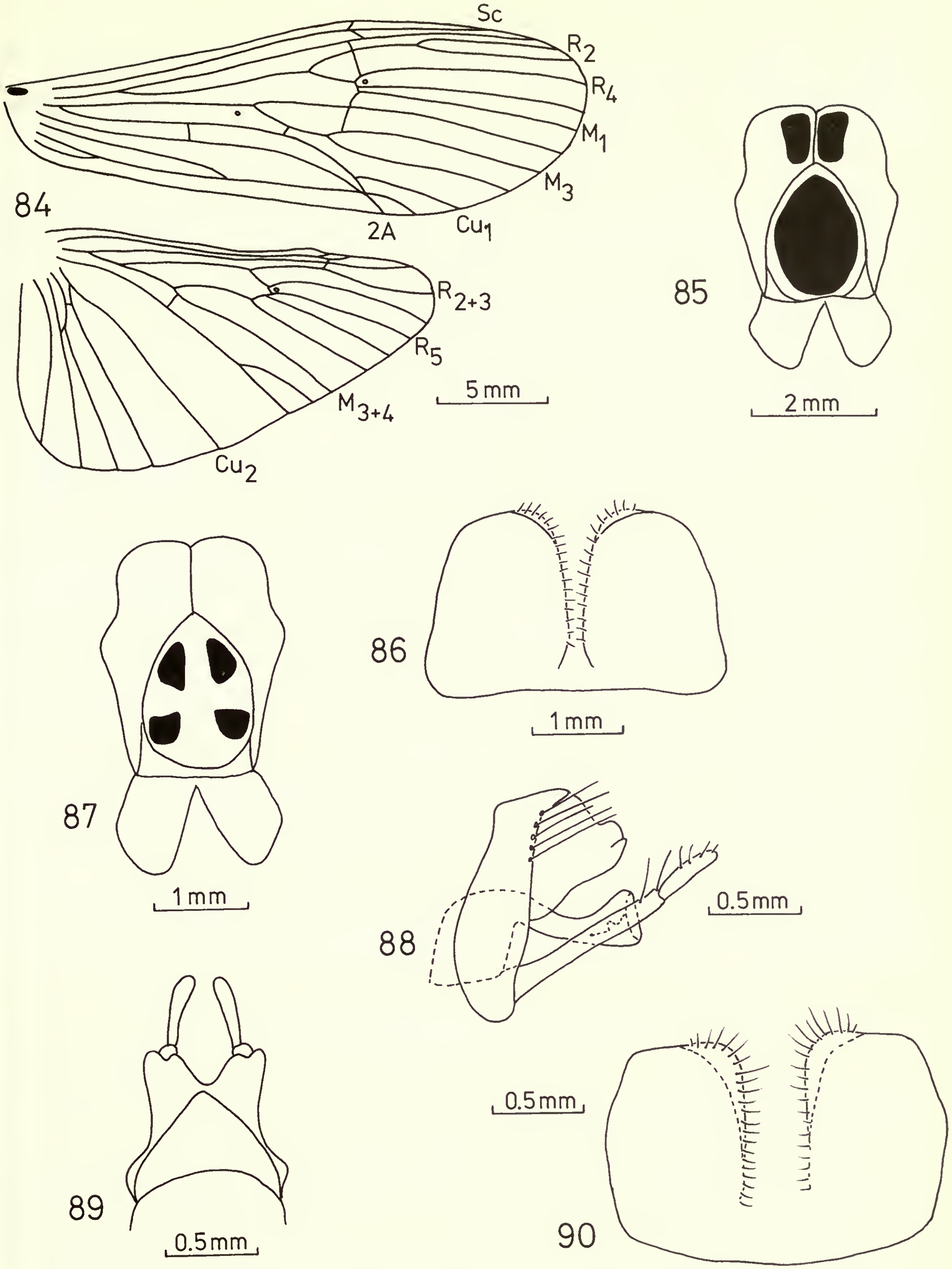
pair subtriangular, the posterior subquadrangular (Fig. 87). Estimated wing length 16 mm, venation probably typical of *nigricornis*-group (specimen damaged). Spurs 1.3.2.

♀. General appearance as ♂, antennae and wings damaged. Estimated wing length 17 mm. Spurs 1.3.3.

GENITALIA ♂ (Figs 88, 89). Tenth segment divided medially, each half with a double lobe, viewed dorsally. Terminal segment of gonopod with clubbed tip, viewed dorso-ventrally.

GENITALIA ♀ (Fig. 90). Thickened inner edges of eighth sternite extend over half-way down segment. Outer edges of sternite with definite obtuse angle.

REMARKS. This species is probably most closely related to *scutellatus*. In the female paratype the mesoscutellar markings are slightly more elongate medially, and rather resemble the form of *scutellatus* from Borneo figured by Ulmer (1951: pl. 10, fig. 224). I think that the differences in female genitalia (the males of *scutellatus* being unknown) are sufficient to warrant describing it as distinct.


Sc
R_2
R_4
M_1
M_3
84
2A
Cu_1
R_{2+3}
R_5
M_{3+4}
Cu_2
5 mm
85
2 mm
86
1 mm
87
1 mm
88
0.5 mm
89
0.5 mm
0.5 mm
90

Figs 84–90 84–86, *Polymorphanisus fuscus* ♀, (84) wing venation; (85) thorax, dorsal view; (86) eighth sternite, ventral view. 87–90, *P. muluensis*, (87) ♂ thorax, dorsal view; (88) ♂ genitalia, lateral view; (89) ♂ genitalia, dorsal view; (90) ♀ eighth sternite, ventral view.

DISTRIBUTION. Borneo (Sarawak).

MATERIAL EXAMINED

Holotype ♂, **Borneo:** Sarawak, Gunong Mulu National Park, i.1978 (*Holloway et al.*) (BMNH).

Paratype. **Borneo:** 1 ♀, Sarawak, Gunong Mulu National Park, at light, ii.1978 (*Holloway et al.*) (BMNH).

Polymorphanisus nigricornis Walker
(Figs 91–93)

Polymorphanisus nigricornis Walker, 1852: 79. Holotype ♂, INDIA: north (*Stevens*) (BMNH) [examined].
Polymorphanisus nigricornis Walker; Betten & Mosely, 1940: 212. [Redescription of holotype.]

♂. Antennae up to 50 mm long, with about 80 segments. Scape and pedicel yellowish brown, flagellum dark brown. Body and wings yellowish brown or greenish in fresh specimens. Thorax with two small, rounded, black spots on mesoscutellum (Fig. 91). Wing length 22–23 mm. Spurs 1.3.3.

♀. Antennae up to 45 mm long, with about 65 segments. Scape and pedicel with longitudinal black stripe externally, flagellum dark brown or black (as in *bipunctatus*, Fig. 52). Rest of coloration as ♂. Wing length 20–29 mm. Spurs 1.3.3.

GENITALIA ♂ (Fig. 92). Similar to *bipunctatus* and *elisabethae*; terminal segment of gonopod long and narrow. Ratio of lengths of basal and terminal segments of gonopod 1.8–2.3:1.

GENITALIA ♀ (Fig. 93). Eighth sternite tapering strongly posteriorly; outer posterior corners produced sharply.

REMARKS. Much of the confusion over this species has resulted from Walker's (1852) inadequate, and even misleading, description. Walker failed to notice the thoracic markings, which are partly obscured by the pin through the holotype, and he also described the male antennae as black, rather than brown. Betten & Mosely (1940) corrected these errors, but not before several authors such as Ulmer (1907) and Banks (1939) had misidentified the species. Fischer (1972: 165) has suggested that some of the specimens from Java and Sumatra listed by Ulmer (1951) are in fact *scutellatus*; Banks's concept of *nigricornis* is discussed under *astictus* (p. 79) and *umbripes* (p. 96). With most of these misidentifications rectified, it now appears that the true *nigricornis* is much more rare and restricted than was previously thought.

Betten & Mosely (1940) suggested that *bipunctatus* was almost certainly a synonym of *nigricornis*, but there are differences in the male and female genitalia which, together with the widely separated distributions, suggest that the two should be kept distinct.

DISTRIBUTION. India, Vietnam, Sumatra, Java.

MATERIAL EXAMINED

India: 1 ♂, no further data; 1 ♀ (*Saunders*); 2 ♀, Manipur, Imphal (*Ram*). **Vietnam:** 1 ♀, Cha Pa, viii.1936 (*Masseyeff*). **Sumatra:** 1 ♀, 1892 (*Forbes*). **Java:** 1 ♀ (*Horsfield*). (All in BMNH.)

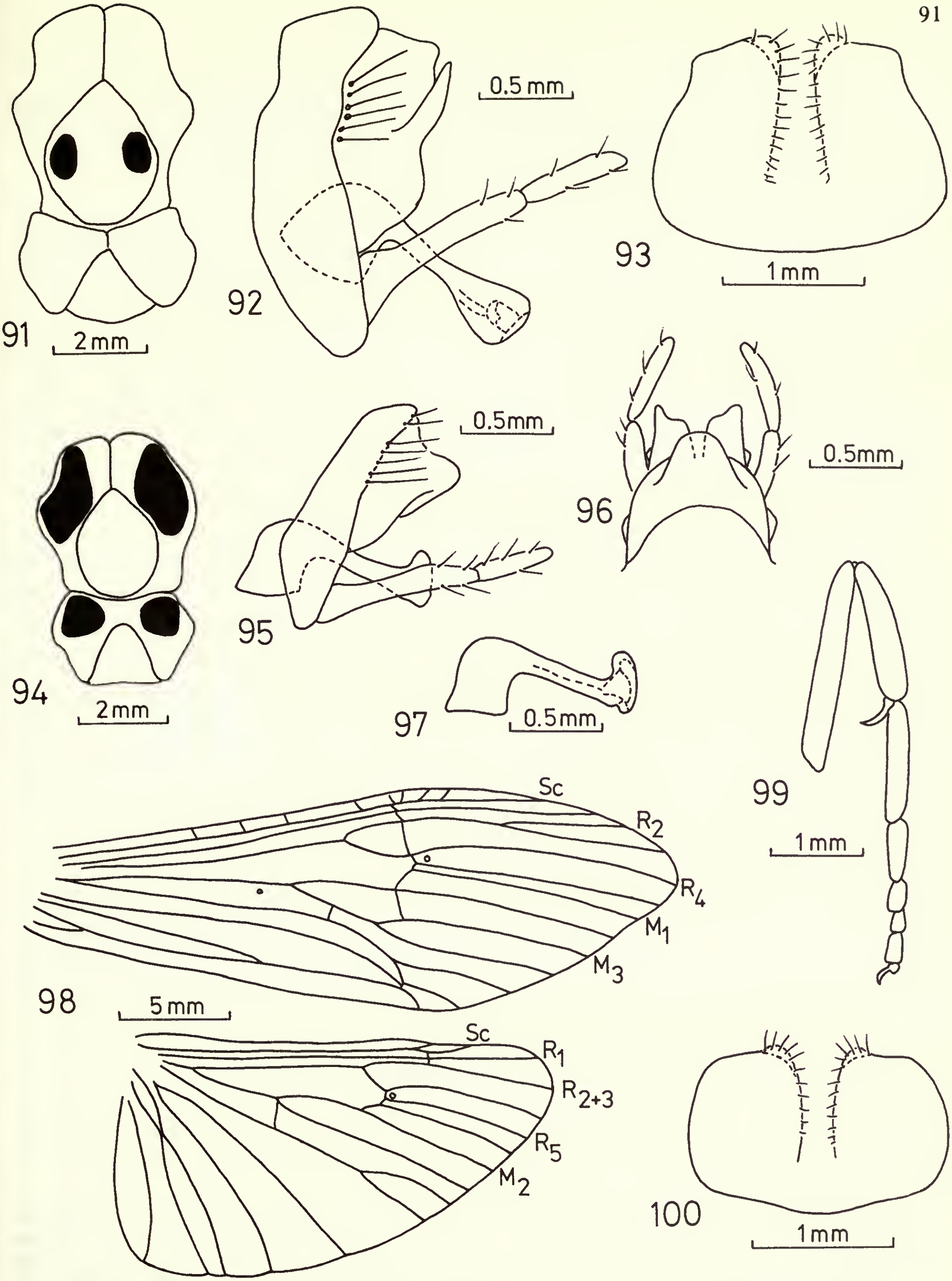
Polymorphanisus quadripunctatus Ulmer
(Figs 94–100)

Polymorphanisus quadripunctatus Ulmer, 1951: 186. Holotype ♀, BORNEO: Nanga Raven [? Nangaraun], vii. 1907 (*Buttikofer*) (ZM, Hamburg) [examined].
Polymorphanisus quadripunctatus Ulmer; Weidner, 1964: 91. [Holotype depository.]

♂. Antennae 35 mm long, with about 70 segments. Antennal segments pale golden yellow, with dark brown joints. Body yellowish brown, thorax with four black markings, two on mesoscutum and two on metascutum (Fig. 94). Wings greenish yellow, wing length estimated 18 mm (single specimen damaged). Spurs 1.3.3, spur on fore leg very long and curved.

♀. Similar to ♂, wing length 17–23 mm. Venation as in Fig. 98. Spurs 1.3.3, spur on fore leg curved as in ♂ (Fig. 99).

GENITALIA ♂ (Figs 95–97). Distal segment of gonopod long and narrow. Aedeagus with prominent disc-like enlargement at apex, not gradually thickened.


91
2 mm
92
0.5 mm
93
1 mm
94
2 mm
95
0.5mm
96
0.5mm
97
0.5mm
98
5 mm
Sc
R2
R4
M1
M3
Sc
R1
R2+3
R5
M2
99
1 mm
100
1 mm

Figs 91–100 91–93, *Polymorphanisus nigricornis,* (91) ♂ thorax, dorsal view; (92) ♂ genitalia, lateral view; (93) ♀ eighth sternite, ventral view. 94–100, *P. quadripunctatus,* (94) ♂ genitalia, dorsal view; (95) ♂ genitalia, lateral view; (96) ♂ genitalia, dorsal view; (97) aedeagus, lateral view; (98) ♀ wing venation; (99) ♀ fore leg; (100) ♀ eighth sternite, ventral view.

GENITALIA ♀ (Fig. 100). Sides of eighth sternite strongly rounded, with prominent setigerous projection on inner posterior corners.

REMARKS. This is the first time that the male of this species has been described; the shape of the aedeagus of the single male specimen is strikingly different from all other species in the genus.

DISTRIBUTION. Borneo (Sarawak), Philippines (Palawan).

MATERIAL EXAMINED

Borneo: 2 ♀, Sarawak, Bidi (*Brooks*); 2 ♀, Sarawak, foot of Mt Dulit, junction of rivers Tinjar and Lejok, 1–15.ix.1932 (*Hobby & Moore*); 1 ♂, 14 ♀, Sarawak, Gunong Mulu National Park, at light, ii-iv.1978 (*Holloway et al.*). (All specimens in BMNH.) **Philippines:** 1 ♀, Palawan, Chromite Mine, 28 km W. Puerto Princessa, 1–7.xii.1965 (*Davis*) (USNM, Washington).

Polymorphanisus scutellatus Banks
(Figs 101–103)

Polymorphanisus scutellatus Banks, 1939: 55. Holotype ♀, BORNEO: Sarawak, Baram River district, 1912 (*Smith*) (type no. 23472, MCZ, Harvard) [examined].
Polymorphanisus scutellaris Banks; Kimmins, 1955: 399. [Incorrect subsequent spelling of *scutellatus* Banks.]

♂. Unknown.

♀. Antennae up to 50 mm long, with about 95 segments. Antennal segments yellowish brown, slightly darker distally. Body colour yellowish brown, thorax with two very large oval black markings on mesoscutellum, which meet sides of sclerite (Fig. 102). Wings pale green or yellowish, wing length 16–24 mm. Venation as in Fig. 101, fork R_2 in fore wing shorter than, or just equal to, its stem. Spurs 1.3.2.

GENITALIA ♀ (Fig. 103). Plates of eighth sternite long and narrow, with broadly rounded excision in outer sides.

REMARKS. All the specimens of *scutellatus* that I have examined have remarkably constant thoracic markings, yet two variations were figured by Ulmer (1951: pl. 10, figs 222, 224). The latter form may be referable to *muluensis* (see p. 88) and the former may conceivably be *unipunctus*; only the collection of a great deal more material from the Indochina peninsula could help to resolve these problems.

DISTRIBUTION. Sumatra, Java (Ulmer, 1951), Borneo (Sarawak), Sulawesi.

MATERIAL EXAMINED

Sumatra: 2 ♀, Medan, 4.ix.1921, Pagar Marbau, 24.vii.1921 (*Corporaal*) (IRSNB, Brussels). **Borneo:** 3 ♀, Sarawak, foot of Mt Dulit, junction of rivers Tinjar and Lejok, at light, 28.viii–1.ix.1932 (*Hobby & Moore*); 1 ♀, Sarawak, Long Lama, at light, 2.i.1967 (*Kueh*); 1 ♀, Sarawak, Gunong Mulu National Park, Batu base camp, at light, 27.v.1978 (*Hammond & Marshall*); 5 ♀, Sarawak, Gunong Mulu National Park, at light, i–iv.1978 (*Holloway et al.*). **Sulawesi:** 2 ♀, Maros, ix.1923 (*Brooks*); 2 ♀, Macassar. (All specimens in BMNH.)

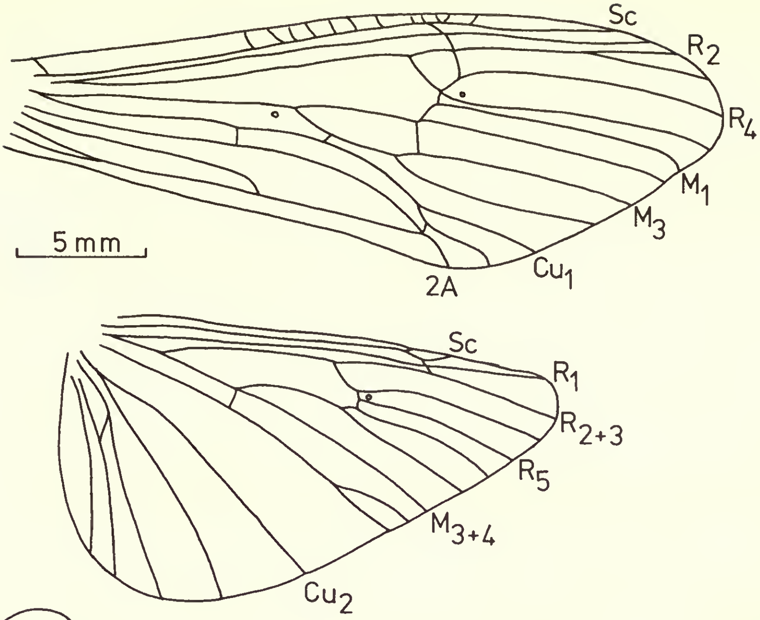
Polymorphanisus semperi (Brauer)
(Figs 104–109)

Oestropsis semperi Brauer, 1868: 264. LECTOTYPE ♂, PHILIPPINES: Mindanao, vii–x.1864 (*Semper*) (IRSNB, Brussels), here designated [examined].
Polymorphanisus semperi (Brauer) Ulmer, 1907: 23.

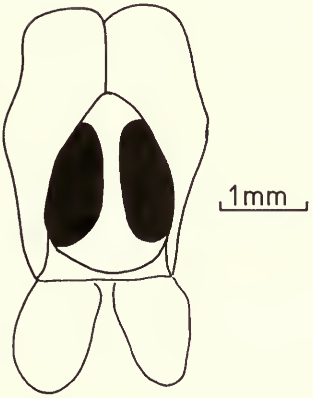
♂. Antennae 50 mm long, with about 90 segments. Scape and pedicel with faint longitudinal brown stripe externally, flagellar segments dark golden brown. Body yellowish brown, thorax with a pair of elongate dark brown or black markings on mesoscutellum, not touching sides of sclerite (Fig. 105). Wings falcate, greenish yellow, with golden yellow stripes along the apical veins. Wing length 19–22 mm, venation as in Fig. 104. Spurs 1.3.3.

♀. Antennae 40 mm long, with up to 85 segments. General coloration as ♂, but scape and pedicel usually lacking brown stripe. Thoracic markings similar to ♂, but often fainter. Wings not falcate, and without apical stripes; venation as in Fig. 108. Wing length 21–27 mm. Spurs 1.3.3.

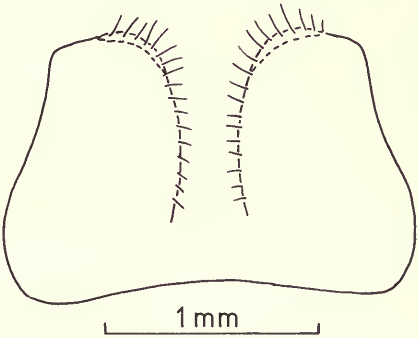
101



102



103



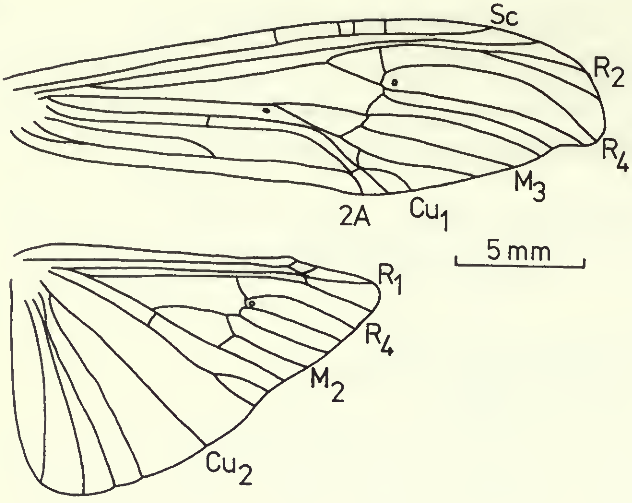
Figs 101–103 *Polymorphanisus scutellatus* ♀. 101, wing venation; 102, thorax, dorsal view; 103, eighth sternite, ventral view.

Genitalia ♂ (Figs 106, 107). Terminal segment of gonopod stout. Tenth segment bilobed, viewed dorsally.

Genitalia ♀ (Fig. 109). Plates of eighth sternite straight-sided, subquadrangular, with only slightly rounded posterior corners.

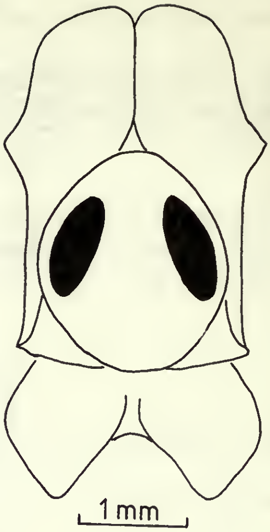
Remarks. I have been unable to identify the type-localities cited by Brauer (1868) as 'Dugang' [? = Duguan] on Mindanao, and 'Baubo'. None of the four syntypes examined was labelled with a locality. I am including the two specimens in the BMNH in the syntype series because, as well as having been labelled as types by McLachlan (from whose collection they originated), one bears a small label with the number '546'. One of the syntypes from the IRSNB, Brussels, bears the number '545' in the same hand, suggesting that both were in the same collected series, although the significance of the numbers is unknown. Brauer did not indicate how many specimens constituted his type-series.

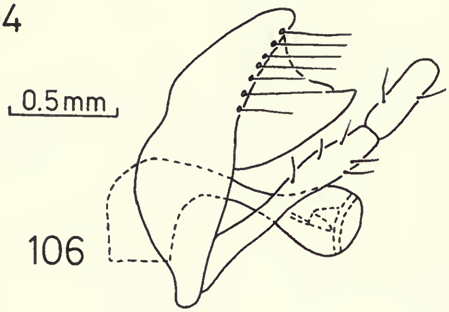
Distribution. Philippines.


Sc
R2
R4
M3
2A
Cu1
5 mm
R1
R4
M2
Cu2

104

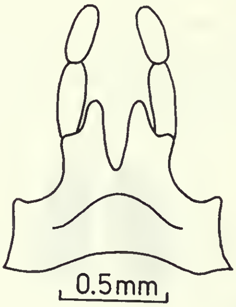
105



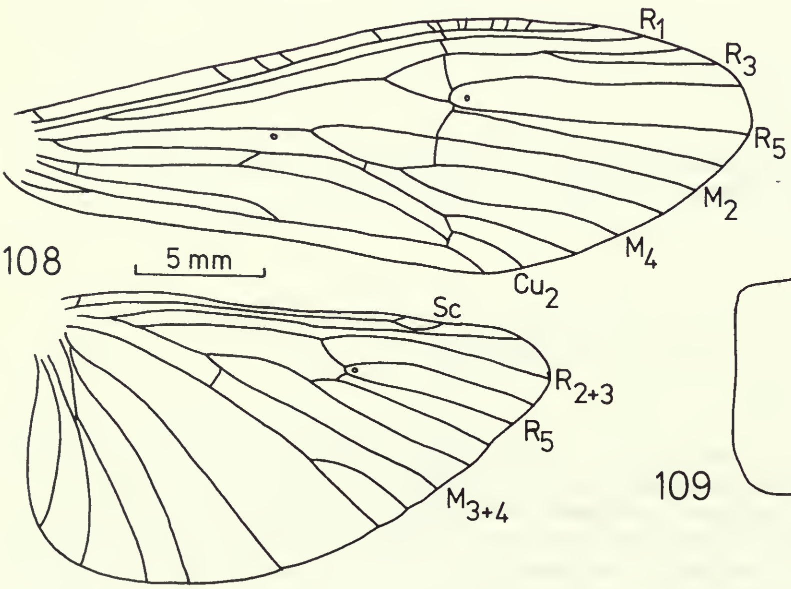


106

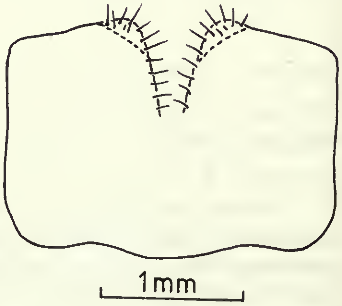
107



108


R1
R3
R5
M2
M4
Cu2
5 mm
Sc
R2+3
R5
M3+4

109



Figs 104–109 *Polymorphanisus semperi*. 104, ♂ wing venation; 105, ♂ thorax, dorsal view; 106, ♂ genitalia, lateral view; 107, ♂ genitalia, dorsal view; 108, ♀ wing venation; 109, ♀ eighth sternite, ventral view.

MATERIAL EXAMINED

Philippines: 2 ♂, 1 ♀, Mindanao, vii–x.1864 (*Semper*) (1 ♂ in IRSNB, Brussels; 1 ♂, 1 ♀ in BMNH) (paralectotypes); 8 ♂, no further data (BMNH); 2 ♂, 3 ♀, Luzon, Mt Makiling; 2 ♂, Mindanao, Surigao (*Baker*) (USNM, Washington).

Polymorphanisus taoninus Navás
(Fig. 110)

Polymorphanisus taoninus Navás, 1936: 128. Holotype ♀, CHINA: Kwangsi-Chuang, Wuchow, 9.v.1934 (*Tao*) (depository unknown) [not examined].

♂. Unknown.

♀ (translated from Navás, 1936). 'Head yellow-fulvous; eyes black; antennae black, first two segments same colour as head, apical segments testaceous, bases of segments dark; longer than 25 mm. Thorax whitish green below, greenish fulvous above. Abdomen yellowish green? (badly preserved). Legs fulvous, second tarsi fulvous-green. Wings unmarked; membrane lightly coloured fulvous-green; venation fulvous-yellow. Anterior wing [Fig. 110]; apical fork 1 [fork R_2] shorter than its stalk; discal cell short and broad, wider than long, outer margin perpendicular to radial sector; median cell more than three times as long, a little wider . . . [etc.]'

'Wing length 23 mm.'

REMARKS. Navás (1936) describes this species as being similar to *astictus*, but the dark antennae and short fork R_2 are very similar to *unipunctus* (described on p. 96). It is possible that Navás may have overlooked a central thoracic spot, which could easily be obscured by the pin, in which case Navás's name would take priority over *unipunctus*.

DISTRIBUTION. China (Kwangsi-Chuang).

Polymorphanisus tumidus Banks
(Figs 111–113)

Polymorphanisus tumidus Banks, 1939: 54. Holotype ♀, INDIA: Mysore, Shimoga, R. Tunga, 1865′ [560 m], at light, 17.iv.[? year] (*Nathan*) (type no. 23468, MCZ, Harvard) [examined].

♂. Unknown.

♀. Antennal length unknown (specimen damaged). Scape with rounded black spot anteriorly (Fig. 112), other segments greenish yellow. Head yellow, with greatly swollen, green frons (Fig. 112). Rest of body greenish yellow, thorax with two elongate black spots, each expanded postero-laterally (Fig. 112). Wing length 20 mm (holotype only), fore wing venation as in Fig. 111: fork R_2 very long. Spurs 1.3.3.

GENITALIA ♀ (Fig. 113). Plates of eighth sternite subquadrangular, with moderately rounded outer corners.

REMARKS. The curiously inflated frons of the unique holotype of this species appears teratological, yet the thoracic and antennal markings distinguish it from all other species of the genus.

DISTRIBUTION. India (Mysore).

MATERIAL EXAMINED

Holotype only.

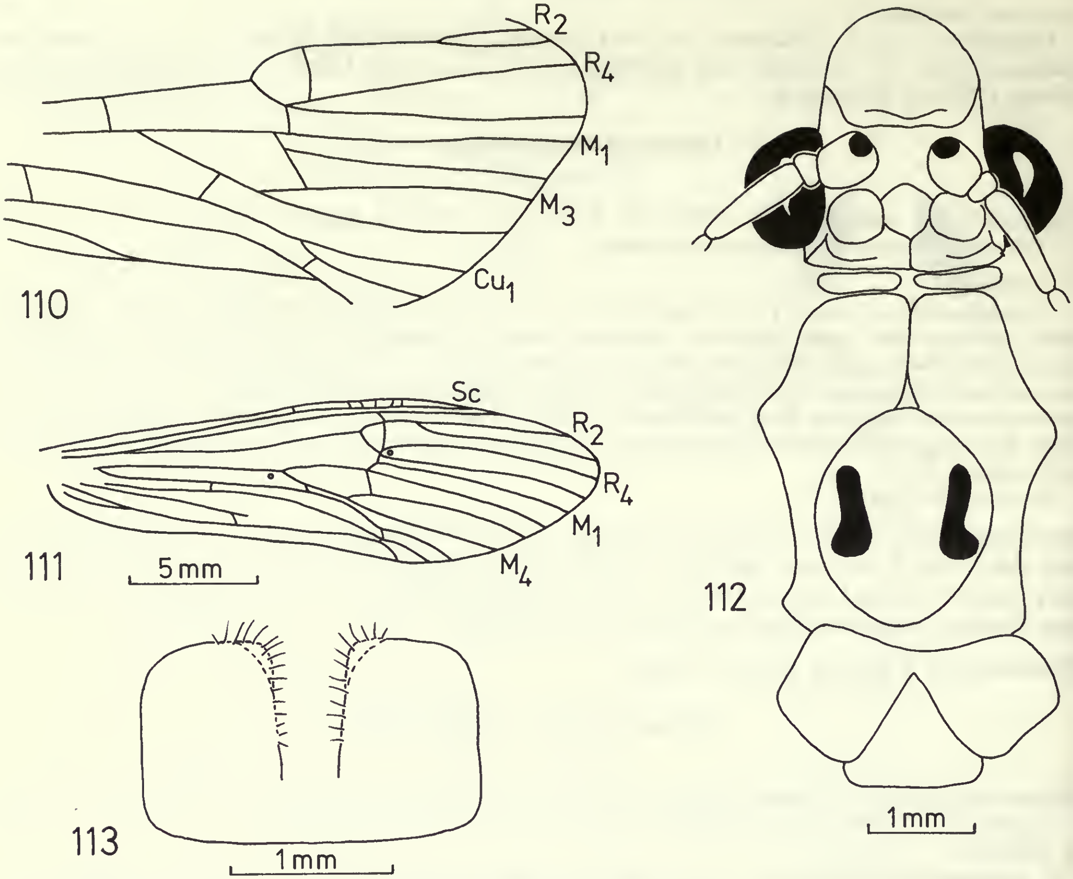
Polymorphanisus umbripes sp. n.
(Figs 114–116)

[*Polymorphanisus nigricornis* Walker; Banks, 1939: 53. Misidentification.]

♂. Unknown.

♀. Antennae up to 40 mm long, with about 75 segments. Scape and pedicel greenish yellow, scape with small dark brown spot distally (occasionally absent), pedicel with lateral brown stripe; flagellar segments dark brown (Fig. 115). Body yellowish brown, abdomen darker dorsally; thorax unmarked. Forelegs with most of femur and whole of tibia dark brown; tarsi yellowish brown. Spurs 1.3.3. Wing length 21–24 mm, venation as in Fig. 114.

GENITALIA ♀ (Fig. 116). Eighth sternite tapering posteriorly, outer posterior corners rounded in a gentle curve.



Figs 110–113 110, *Polymorphanisus taoninus* ♀, part of fore wing (after Navás). 111–113, *P. tumidus* ♀, (111) fore wing venation; (112) head and thorax, dorsal view; (113) eighth sternite, ventral view.

Remarks. This species is based on the series of specimens which Banks (1939) assumed to be *nigricornis* Walker (see remarks under *nigricornis*, p. 90). The two Indian localities of this species are the same for Banks's *flavipes* (= *astictus*) and this would suggest that *umbripes* may be merely a colour variant of the latter with dark antennae and forelegs, but the differences in female genitalia are also consistent in the specimens examined.

Distribution. India (Mysore).

Material examined

Holotype ♀, **India:** Mysore, Shimoga, R. Tunga, 1865′ [560 m], at light, 18.vi. [? year] (*Nathan*) (type no. 32396, MCZ, Harvard).

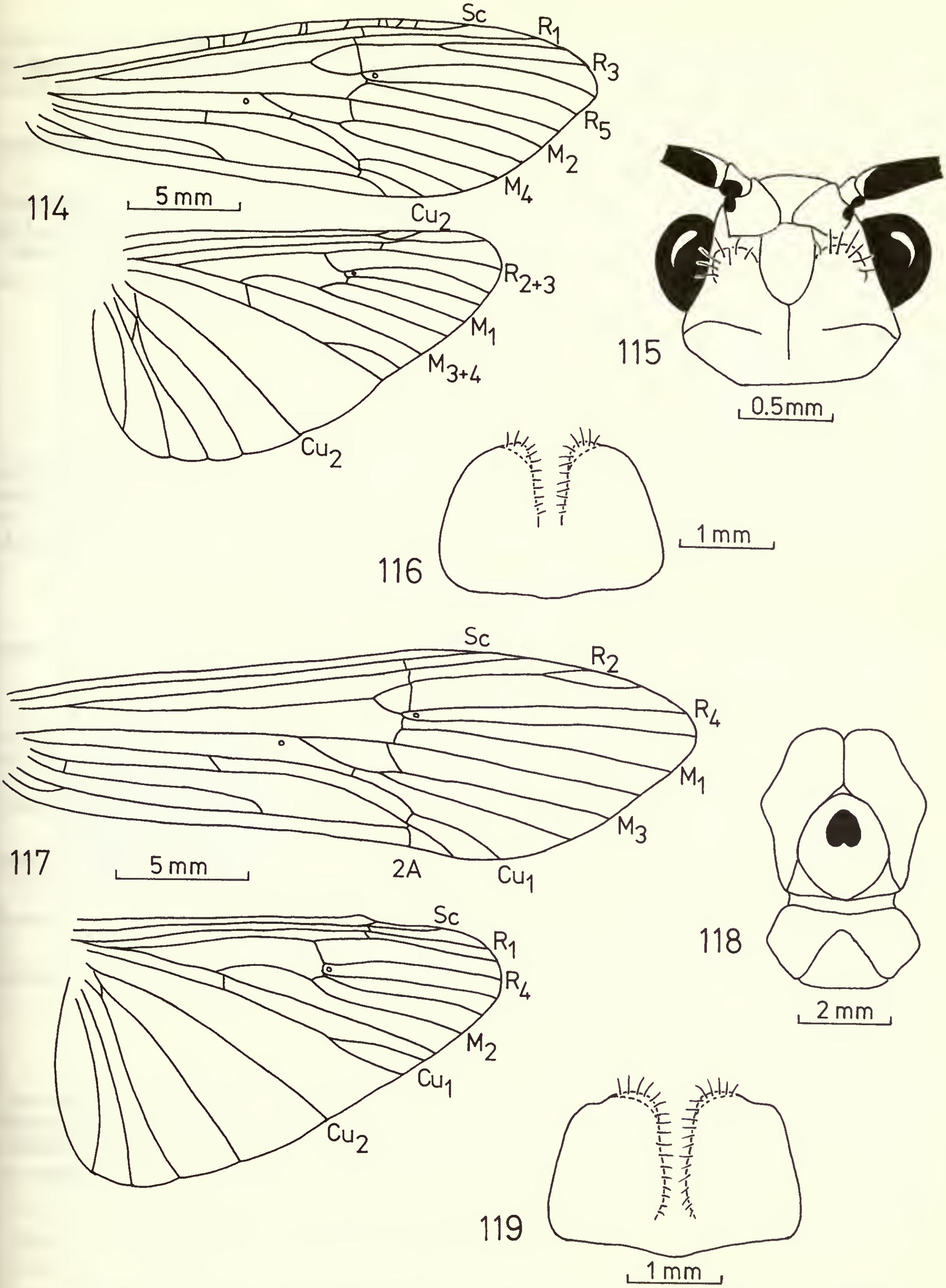
Paratypes. **India:** 29 ♀, data as holotype, various dates (26 in MCZ, Harvard; 2 in USNM, Washington; 1 in BMNH); 4 ♀, Mysore, Bhadravati (*Nathan*) (MCZ, Harvard).

Polymorphanisus unipunctus Banks

(Figs 117–119)

Polymorphanisus unipunctus Banks, 1939: 53. Holotype ♀, China: Szechwan, Suifu [= Ipin], viii.1928 (*Graham*) (type no. 53164, USNM, Washington) [examined].

Polymorphanisus unipunctus Banks; Banks, 1940: 206. [Redescription as new species.]


Sc
R1
R3
R5
M2
M4
114
5 mm
Cu2
R2+3
M1
M3+4
Cu2
115
0.5mm
116
1 mm
Sc
R2
R4
M1
M3
117
5 mm
2A
Cu1
118
2 mm
Sc
R1
R4
M2
Cu1
Cu2
119
1 mm

Figs 114–119 114–116, *Polymorphanisus umbripes* ♀, (114) wing venation; (115) head, dorsal view; (116) eighth sternite, ventral view. 117–119, *P. unipunctus* ♀, (117) wing venation; (118) thorax, dorsal view; (119) eighth sternite, ventral view.

♂. Unknown.

♀. Antennal length unknown (specimen damaged). Scape and pedicel yellow, flagellar segments dark brown. Body yellowish brown, thorax with a single, partially divided, black spot in anterior half of mesoscutellum (Fig. 118). Wing length 25 mm, venation as in Fig. 117; fork R_2 shorter than its stem. Spurs 1.3.2.

GENITALIA ♀ (Fig. 119). Setigerous posterior margin of each half of eighth sternite produced in a rounded lobe.

REMARKS. The possible similarity of this species with Navás's description of *taoninus* is discussed under the latter species. Banks's (1939) first description of this species was obviously intended to be published later than his second paper (1940). In the *Trichopterorum Catalogus* Fischer (1963: 209) lists the first reference as 'nomenclatorially invalid', presumably as a nomen nudum, but in fact this first (1939) paper contains sufficient detail to constitute a valid description.

DISTRIBUTION. China (Szechwan).

MATERIAL EXAMINED
Holotype only.

The *ocularis*-group

Pale greenish white species, never with markings on thorax. Wings broad, with brown markings (absent in *angustipennis*). Antennae up to one and a half times fore wing length. Male eyes large, almost meeting ventrally. Spurs 1.3.2. In fore wing M_1 is direct continuation of M_{1+2} stem, M_2 arises from median cell. In hind wing R_1 ends on *Sc*. Basal segment of male gonopods expanded, terminal segment not differentiated.

Polymorphanisus angustipennis Ulmer
(Figs 120–128)

Polymorphanisus angustipennis Ulmer, 1912: 97. Holotype ♂, CAMEROUN: Ma[y]o Godi, 9–13.vi.1909 (*Riggenbach*) (MNHU, Berlin) [examined].
Polymorphanisus sp.; Marlier & Botosaneanu, 1968: 11. [Compared with *P. similis* Ulmer.]

♂. Antennae up to 20 mm long, with about 50 segments. Antennae and rest of body pale yellowish brown, legs greenish, wings greenish white, with no dark markings. Eyes very large, almost meeting ventrally (Fig. 122). Wing length 12–14 mm, venation as in Fig. 120. Spurs 1.3.2.

♀. Antennae and general coloration as in ♂. Eyes small, well separated ventrally (Fig. 127). Wing length 15–17 mm, venation as in Fig. 125. Spurs 1.3.2.

GENITALIA ♂ (Figs 123, 124). Ninth segment bifurcate dorsally. Gonopods only moderately expanded basally.

GENITALIA ♀ (Fig. 128). Eighth sternite long and narrow, straight-sided, with only slightly rounded posterior corners.

REMARKS. This species is easily distinguished from *similis*, with which it shares a similar distribution, by the absence of wing markings.

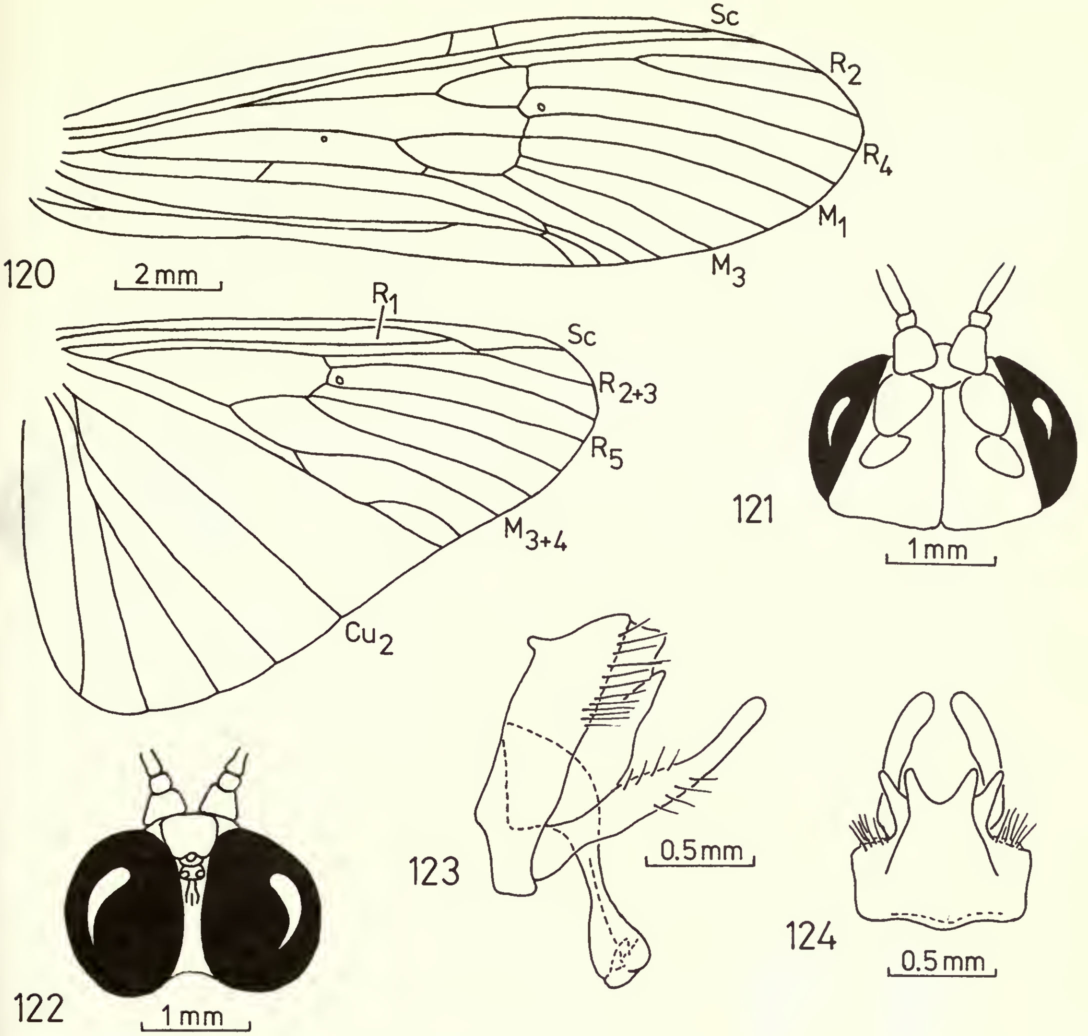
DISTRIBUTION. Ghana, Nigeria, Cameroun, Sudan, Uganda.

MATERIAL EXAMINED
Ghana: 1 ♂, Volta R., Yeji, 14.x.1950 (*Berner*). **Nigeria:** 1 ♀, Kaduna, 16.x.1957; 16 ♀, Samaru, at light, 7–14.vii.1970 (*Ward*); 38♂, 8 ♀, Lake Kainji, 1975 (*Bidwell*). **Sudan:** 2 ♀, Malakal–Shambe, 8–14.xii.1961 (*Cloudsley-Thompson*). **Uganda:** 2 ♀, Ugweano, 22.viii.1949 (*Lowe*); 2 ♀, Lake Victoria, Bukakata, 13.xii.1950 (*Lowe*), 6.viii.1959 (*Corbet*); 2 ♂, Mengo, Entebbe, 28–30.iii.1956 (*Corbet*). (All specimens in BMNH.)

Polymorphanisus guttatus Navás
(Figs 133, 134)

Polymorphanisus guttatus Navás, 1935: 71. Holotype ♀, MADAGASCAR: Ambodirefia, 70 km NW. of Tamatave, ii.1934 (MNHN, Paris) [examined].

♂. Unknown.



Figs 120–124 *Polymorphanisus angustipennis* ♂. 120, wing venation; 121, head, dorsal view; 122, head, ventral view; 123, genitalia, lateral view; 124, genitalia, dorsal view.

♀. Antennal length at least 25 mm (specimens damaged). Scape and pedicel yellow, first flagellar segment dark brown distally, rest of flagellum dark brown. Body yellowish brown. Wing length 16–20 mm, membrane greenish, with one brown spot on median cell of fore wing, at base of M_2 and M_3 (Fig. 133). Spurs 1.3.2.

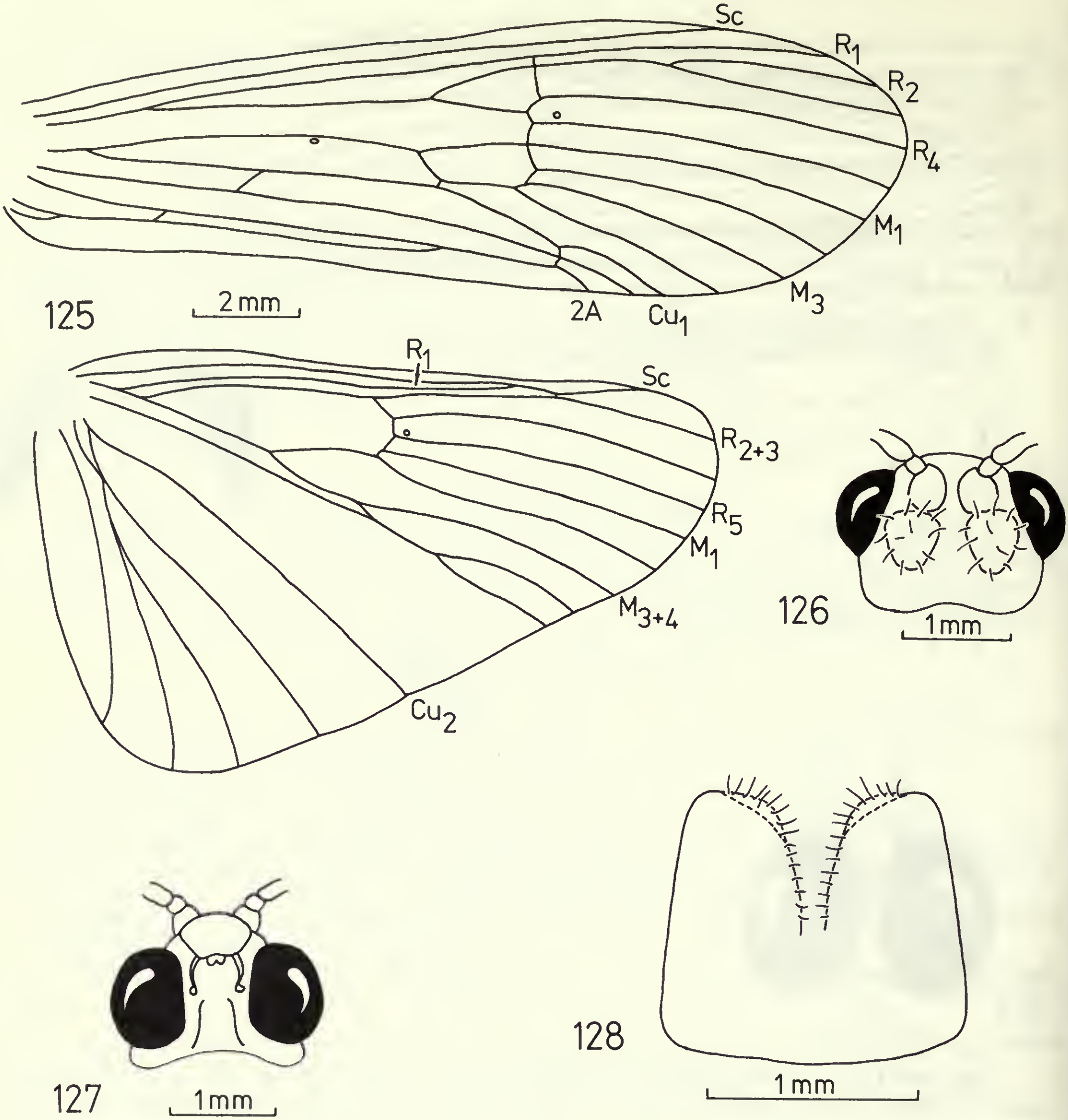
GENITALIA ♀ (Fig. 134). Eighth sternite broad centrally, posterior corners obtusely rounded. Setigerous lobe on posterior margin strongly produced.

REMARKS. This species, apparently endemic to Madagascar, is easily recognized by the dark antennae and single spot on the fore wing.

DISTRIBUTION. Madagascar.

MATERIAL EXAMINED

Madagascar: 1 ♀, Station Perinet, 149 km E. of Tananarive, 20.x–10.xi.1930 (*d'Olsoufieff*) (BMNH).



Figs 125–128 *Polymorphanisus angustipennis* ♀. 125, wing venation; 126, head, dorsal view; 127, head, ventral view; 128, eighth sternite, ventral view.

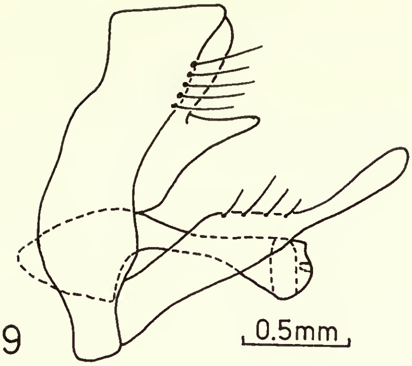
Polymorphanisus ocularis Ulmer
(Figs 135–138)

Polymorphanisus ocularis Ulmer, 1906: 60. LECTOTYPE ♀, JAVA (*Piepers*) (RNH, Leiden), here designated [examined].

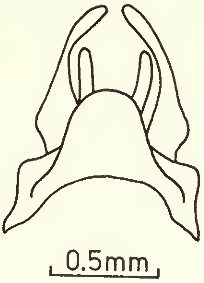
Polymorphanisus indicus Banks, 1911: 105. Holotype ♀, INDIA: Bengal, Pusa, at light, 4.viii.1909 (type no. 11787, MCZ, Harvard) [examined]. **Syn. n.**

Polymorphanisus ocularis Ulmer, unnamed var.; Martynov, 1935: 195.

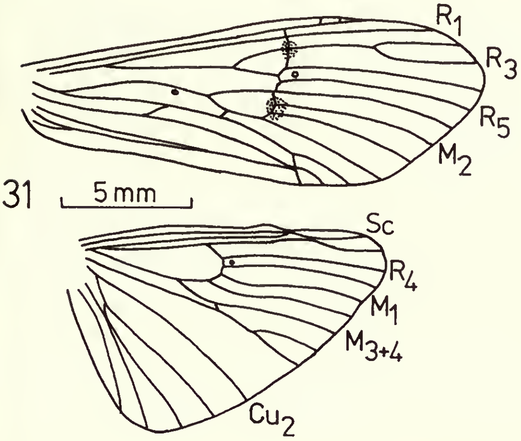
♂. Antennae up to 23 mm, with about 50 segments. Antennal segments pale golden yellow. Body pale yellowish white, abdomen yellowish brown dorsally. Wings white, occasionally greenish, with two brown



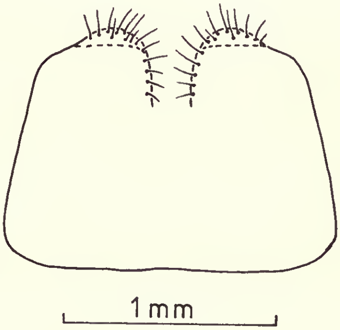
129



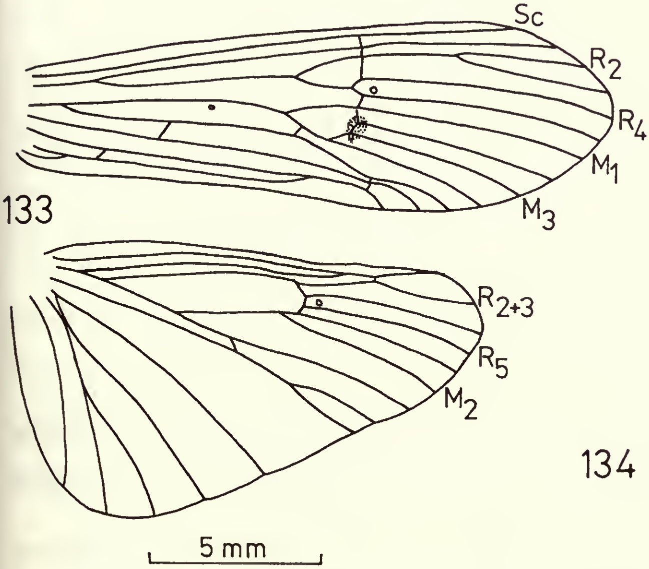
130


R1
R3
R5
M2
5 mm
Sc
R4
M1
M3+4
Cu2

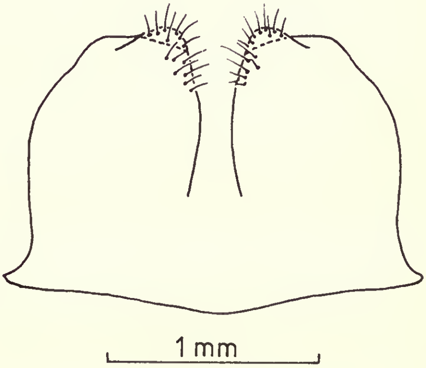
131



132

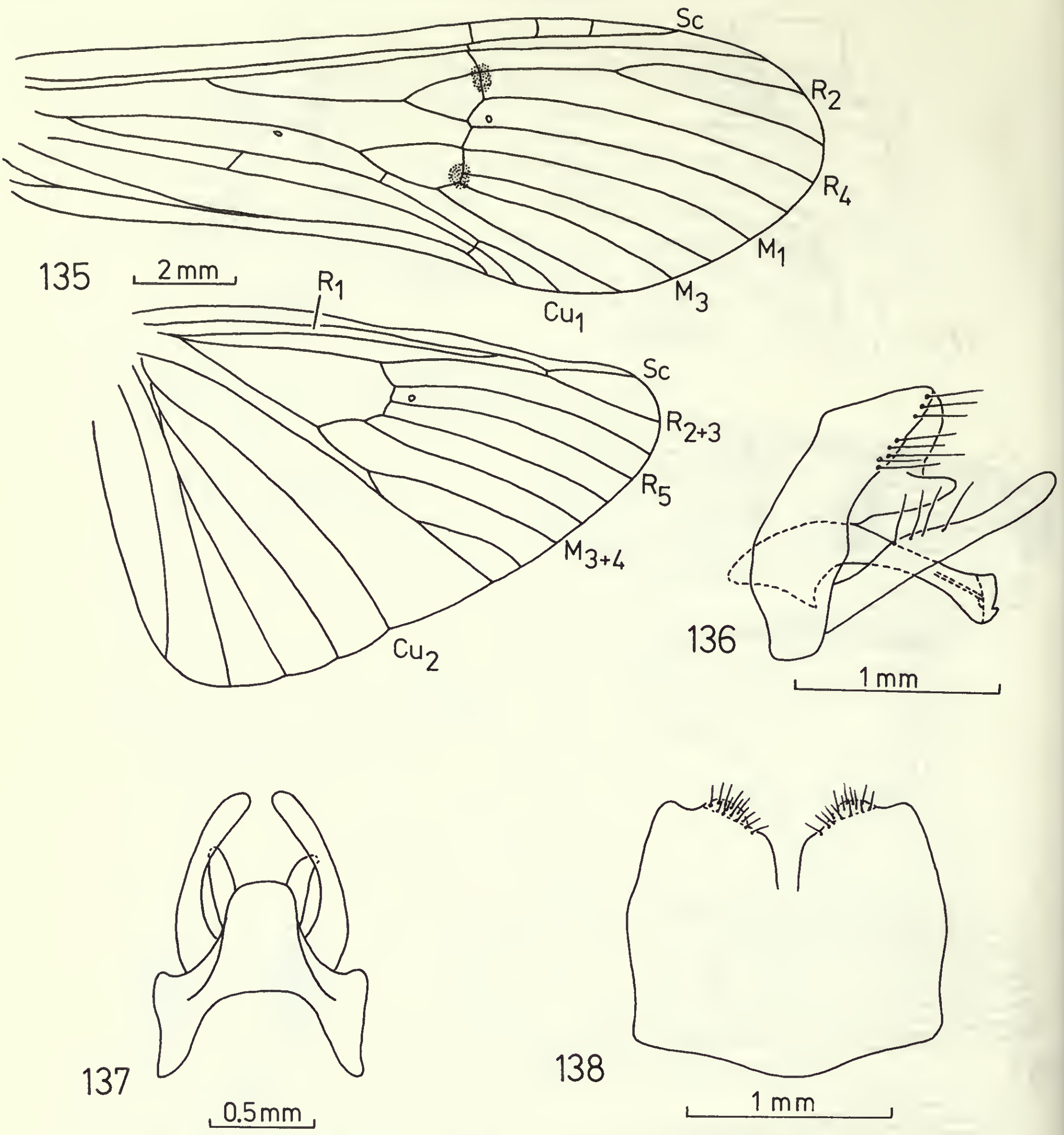

Sc
R2
R4
M1
M3
R2+3
R5
M2
5 mm

133



134

Figs 129–134 129–132, *Polymorphanisus similis,* (129) ♀ genitalia, lateral view; (130) ♂ genitalia, dorsal view; (131) ♀ wing venation; (132) ♀ eighth sternite, ventral view. 133, 134, *P. guttatus* ♀, (133) wing venation; (134) eighth sternite, ventral view.



Figs 135–138 *Polymorphanisus ocularis*. 135, ♂, wing venation; 136, ♂ genitalia, lateral view; 137, ♂ genitalia, dorsal view; 138, ♀ eighth sternite, ventral view.

spots on fore wing, one on discal cell at base of R_{2+3}, the other on median cell at base of M_2 and M_3 (Fig. 135). Wing length 14–16 mm. Spurs 1.3.2.

♀. Antennae up to 22 mm, with about 50 segments. Coloration as in ♂. Wing length 14–18 mm. Spurs 1.3.2.

Genitalia ♂ (Figs, 136, 137). Ninth segment produced in a squarish lobe dorsally. Gonopods relatively narrow at base, thickened in centre.

Genitalia ♀ (Fig. 138). Outer posterior corners of eighth sternite produced into rounded lobes, almost as long as setigerous lobes on inner corners.

REMARKS. Banks's (1911) species *indicus* was described without reference to *ocularis*, although he later (1939) listed both in the same paper. Martynov (1935) remarked that he could not separate the two, and Ulmer (1951) noted their great similarity; in fact they cannot be separated and *indicus* is here synonymized.

Ulmer described *ocularis* from one male and one female, but the male is now apparently missing (Geijskes, *in litt.*). I have therefore designated the female as lectotype.

DISTRIBUTION. India, Sri Lanka, Burma (Martynov, 1935), China (Fuchow), West Malaysia, Borneo (Sarawak), Java, Sumatra (Ulmer, 1951).

MATERIAL EXAMINED

1 ♂, 1 ♀, no data (*Chapman*) (BMNH). **Sri Lanka:** 1 ♂ Colombo, iii.1927 (BMNH); 2 ♀, Marai Villu, 19–21.iii.1933 (BMNH); 1 ♀, Marichchukkaddi, 28.iii.1933 (BMNH); 1 ♀, Puttalam (BMNH); 1 ♀, Boyagama, at light, 20–21.viii.1973 (*Ekis*) (USNM, Washington); 2 ♀, Wilpattu Park, Talawila, at light, 9–10.iv.1973 (*Baumann & Cross*) (USNM, Washington), 1 ♀, Hunuwilagama, Wilpattu, 10–19.iii.1970 (*Davis & Rowe*) (USNM, Washington); 2 ♀, Polonnaruwa, 16–21.iii.1954, 1 ♀, Mi Oya, 25.iii.1954 (*Schmid*) (USNM, Washington). **China:** 1 ♀, Fuchow (*Yang*) (BMNH). **West Malaysia:** 1 ♀, Kuala Pilah (BMNH); 3 ♀, Kuala Lumpur, 28.vi.1929, 23.iv.1931, 6.vi.1932 (*Pendlebury*) (BMNH); 2 ♀, Kota Tinggi, Johore, viii.1917 (BMNH). **Borneo:** 1 ♂, no further data (BMNH); 2 ♀, Sarawak, Gunong Mulu National Park, i–iv.1978 (*Holloway et al.*) (BMNH).

Polymorphanisus similis Ulmer
(Figs 129–132)

Polymorphanisus similis Ulmer, 1912: 96. Holotype ♂, CAMEROUN: Lolodorf, 16.v.1896 (*Conradt*) (MNHU, Berlin) [examined].

Polymorphanisus bisignatus Navás, 1931*b*: 276. Holotype ♀, ZAIRE: Katanga, Kafakumba, 16.v.1925 (*Overlaet*) (MRAC, Tervuren) [examined]. **Syn. n.**

♂. Antennal length 23 mm (holotype), antennal segments pale yellow. Body pale yellow, abdomen darker dorsally. Wings white, occasionally greenish, with two brown spots on fore wing, one on discal cell at base of R_{2+3} and one on median cell at base of M_2 and M_3. Wing length 13–16 mm. Spurs 1.3.2.

♀. Antennal length up to 30 mm, with up to 60 segments. Coloration as ♂, wing venation as in Fig. 131. Wing length 16–23 mm. Spurs 1.3.2.

GENITALIA ♂ (Figs 129, 130). Ninth segment produced into a broad rounded lobe dorsally. Gonopods very broad at base, narrowing suddenly in centre.

GENITALIA ♀ (Fig. 132). Eighth sternite gradually tapering posteriorly, posterior edge sloping evenly to setigerous lobes.

REMARKS. Although Ulmer's descriptions were usually accurate, he mistakenly described the spur formula of this species as being 2.3.3 (Ulmer, 1912). The male holotype is clearly seen to have the spur formula 1.3.2, typical of this group. This inaccuracy has confused authors such as Marlier (1961) who draws attention to the apparent discrepancy between his female specimen and the description of the male holotype. However, Marlier & Botosaneanu's (1968) '*Polymorphanisus* cf. *similis*' is *angustipennis*, as shown by the lack of wing markings.

DISTRIBUTION. Sierra Leone, Nigeria, Cameroun, Zaire, Uganda.

MATERIAL EXAMINED

Sierra Leone: 1 ♀, Bo, ix.1968 (*Revell*); 2 ♀, Njala, 11.viii.1929, ix.1934 (*Hargreaves*). **Nigeria:** 1 ♂, Ilesha (*Humfrey*); 1 ♀, Zungeru, xi.1910 (*Simpson*); 1 ♀, Abuja, at light, 21.xi.1970 (*Deeming*); 1 ♀, Kagoro Forest, 15–17.x.1971 (*Deeming*). (All specimens in BMNH.) **Uganda:** 1 ♀, Ankole, 25 m [40 km] S. of Kichwamba, Kalinzu Forest, 28.iv.1968 (*Spangler*) (USNM, Washington).

References

Banks, N. 1911. Notes on Indian Neuropteroid insects. *Proc. ent. Soc. Wash.* **13:** 99–106.

—— 1913. Neuropteroid insects from Brazil. *Psyche, Camb.* **20:** 83–89.

—— 1920. New Neuropteroid insects. *Bull. Mus. comp. Zool. Harv.* **64:** 299–362.

—— 1938. Further Neuropteroid insects from Malaya. *J. fed. Malay St. Mus.* **18:** 220–235.

—— 1939. Notes and descriptions of Oriental Oestropsychinae (Trichoptera). *Psyche, Camb.* **46:** 52–61.

—— 1940. Report on certain groups of Neuropteroid insects from Szechwan, China. *Proc. U.S. natn. Mus.* **88:** 173–220.

Barnard, K. H. 1934. South African caddis-flies (Trichoptera). *Trans. R. Soc. S. Afr.* **21:** 291–394.

Betten, C. 1934. The caddis flies or Trichoptera of New York state. *Bull. N.Y. St. Mus.* no. 292: 1–576.

Betten, C. & Mosely, M. E. 1940. *The Francis Walker types of Trichoptera in the British Museum.* x + 248 pp. London.

Brauer, F. 1868. Neue von Herrn Dr. G. Semper gesammelte Neuropteren. *Verh. zool.-bot. Ges. Wien* **18:** 263–268.

—— 1875. Beschreibung neuer und ungenügend bekannter Phryganiden und Oestriden. *Verh. zool.-bot. Ges. Wien* **25:** 69–78.

Crosskey, R. W. & White, G. B. 1977. The Afrotropical region. A recommended term in zoogeography. *J. nat. Hist.* **11:** 541–544.

Denning, D. G. 1943. The Hydropsychidae of Minnesota. *Entomologica am.* **23:** 101–171.

Fischer, F. C. J. 1963. *Trichopterorum Catalogus* **4.** vi + 226 pp. Amsterdam.

—— 1972. *Trichopterorum Catalogus* **13.** vii + 172 pp. Amsterdam.

Flint, O. S. 1974. The Trichoptera of Surinam. *Uitg. natuurw. StudKring Suriname* **14** (55): 1–151.

—— 1978. Studies of neotropical caddiesflies [sic], XXII. Hydropsychidae of the Amazon basin (Trichoptera). *Amazoniana* **6:** 373–421.

Gibbs, D. G. 1973. The Trichoptera of Ghana. *Dt. ent. Z.* (N.F.) **20:** 363–424.

Hagen, H. A. 1859. Synopsis der Neuroptera Ceylons (Pars II). *Verh. zool.-bot. Ges. Wien* **9:** 199–212.

—— 1864. Phryganidarum synopsis synonymica. *Verh. zool.-bot. Ges. Wien* **14:** 799–890.

Kimmins, D. E. 1955. Results of the Oxford University expedition to Sarawak, 1932. Order Trichoptera. *Sarawak Mus. J.* **6:** 374–442.

—— 1957. Lectotypes of Trichoptera from the McLachlan collection now in the British Museum (Natural History). *Bull. Br. Mus. nat. Hist* (Ent.) **6:** 91–126.

—— 1962. New African caddis-flies (Order Trichoptera). *Bull. Br. Mus. nat. Hist.* (Ent.) **12:** 81–121.

Kolenati, F. 1859. Genera et species Trichopterorum. Pars altera. Aequipalpidae. *Nouv. Mém. Soc. imp. Nat. Mosc.* **11:** 141–296.

Lepneva, S. G. 1970. Trichoptera. II (1). Larvae and pupae of Annulipalpia. *Fauna SSSR* **88:** iv + 638 pp. [English translation.]

Lestage, J. A. 1919. Les Trichoptères d'Afrique. Catalogue synonymique et systématique des espèces connues. *Revue zool. afr.* **6:** 251–336.

—— 1936. Notes trichoptérologiques. XIV. Les composantes de la faune sud-africaine et la dispersion transafricaine de quelques espèces. *Bull. Annls Soc. r. ent. Belg.* **76:** 165–192.

Marlier, G. 1943. Trichoptères du Congo belge. *Revue Zool. Bot. afr.* **37:** 64–88.

—— 1958. Recherches hydrobiologiques au Lac Tumba. *Hydrobiologia* **10:** 352–385.

—— 1961. Hydropsychidae du Kivu (Trichoptera). *Revue Zool. Bot. afr.* **63:** 158–212.

—— 1962. Genera des Trichoptères de l'Afrique. *Annls Mus. r. Afr. cent.* Sér. 8°. Sciences Zoologiques. **109:** 1–263.

—— 1965. Les Trichoptères du musée de Dundo. *Publções cult. Co. Diam. Angola* **72:** 13–80.

—— 1978. Sur une collection de Trichoptères de l'Afrique occidentale. *Revue zool. afr.* **92:** 283–302.

Marlier, G. & Botosaneanu, L. 1968. Trichoptères du Ghana et de la Côte d'Ivoire. *Bull. Inst. r. Sci. nat. Belg.* **44** (16): 1–16.

Martynov, A. V. 1910. The Trichoptera of Siberia and adjacent regions. [In Russian.] *Ezheg. zool. Mus.* **15:** 351–429.

—— 1930. On the Trichopterous fauna of China and eastern Tibet. *Proc. zool. Soc. Lond.* **1930:** 65–112.

—— 1934. Trichoptera Annulipalpia of the U.S.S.R. [In Russian, English summary.] *Opred. Faune SSSR* **13:** 1–343.

—— 1935. On a collection of Trichoptera from the Indian Museum. *Rec. Indian Mus.* **37:** 93–209.

McLachlan, R. 1878. *A monographic revision and synopsis of the Trichoptera of the European fauna.* Part VII. pp. 349–428. London.

—— 1880. *A monographic revision and synopsis of the Trichoptera of the European fauna.* Supplement. Part II. pp. 13–84. London.

Navás, L. 1915. Notes sur quelques Névroptères du Congo belge. *Revue zool. afr.* **4:** 172–182.

—— 1916. Neurópteros nuevos o poco conocidas. *Mems R. Acad. Cienc. Artes Barcelona* **12:** 219–243.

—— 1923*a*. Algunos insectos del museo de París. *Revta Acad. Cienc. exact. fis. quím. nat. Zaragoza* **7** (1922): 15–51.

—— 1923*b*. Insecta nova. *Memorie Accad. pont. Nuovi Lincei* (2) **6**: 19–27.
—— 1926. Névroptères d'Egypte et de Palestine. *Bull. Soc. ent. Egypte* **19**: 192–216.
—— 1931*a*. Insectes du Congo belge. *Revue zool. afr.* **21**: 123–144.
—— 1931*b*. Insectes du Congo belge. *Revue zool. afr.* **20**: 257–279.
—— 1935. Insectos de Madagascar. *Revta Acad. Cienc. exact. fis. quím. nat. Zaragoza* **18** (1934): 42–74.
—— 1936. Névroptères et insectes voisins. *Notes Ent. chin.* **3**: 117–132.

Ross, H. H. 1952. Lectotypes of Hagen species belonging to certain families of Trichoptera. *Psyche, Camb.* **59**: 31–36.

Schmid, F. 1958. Trichoptères de Ceylan. *Arch. Hydrobiol.* **54**: 1–173.

Scott, K. M. F. 1975. The value of larval stages in systematic studies of the Trichoptera, with particular reference to the Hydropsychidae from Africa south of the Sahara. *Proc. 1st Congr. ent. Soc. S. Afr.* **1975**: 41–52.

Tomaszewski, C. 1961. List of type specimens in the collection of the Institute of Zoology of the Polish Academy of Sciences in Warszawa. IV. Caddis flies (Trichoptera). *Annls zool. Warsz.* **20**: 1–6.

Ulmer, G. 1905*a*. Zur Kenntniss aussereuropäischer Trichopteren. *Stettin. ent. Ztg* **66**: 3–119.
—— 1905*b*. Über die geographische Verbreitung der Trichopteren. *Z. wiss. InsektBiol.* **1**: 16–32.
—— 1906. Neuer Beitrag zur Kenntnis aussereuropäischer Trichopteren. *Notes Leyden Mus.* **28**: 1–116.
—— 1907. Trichopteren. Monographie der Macronematinae. *Collections Zoologiques du Baron Edm. de Selys Longchamps* **6** (2): 1–121. Brussels.
—— 1912. Trichopteren von Äquatorial-Afrika. *Ergebn. Zw. dt. zent. Afr. Exped.* **4**: 81–125.
—— 1926. Beiträge zur Fauna sinica. III. Trichopteren und Ephemeropteren. *Arch. Naturgesch.* **91** (A) 5 (1925): 19–110.
—— 1930. Trichopteren von den Philippinen und von den Sunda-Inseln. *Treubia* **11**: 373–498.
—— 1933. Aquatic insects of China. IV. Neue chinesische Trichopteren. *Peking nat. Hist. Bull.* **7**: 135–157.
—— 1951. Köcherfliegen (Trichopteren) von den Sunda-Inseln (Teil I). *Arch. Hydrobiol.* Suppl. 19: 1–528.
—— 1957. Köcherfliegen (Trichopteren) von den Sunda-Inseln (Teil III). *Arch. Hydrobiol.* Suppl. 23: 109–470.

Walker, F. 1852. *Catalogue of the specimens of Neuropterous insects in the collection of the British Museum.* Part I. 192 pp. London.

Weidner, H. 1964. Die entomologischen Sammlungen des Zoologischen Staatsinstituts und Zoologischen Museums Hamburg. *Mitt. hamb. zool. Mus. Inst.* **62**: 55–100.

Index

Synonyms are in *italics;* main references are in **bold.** References to the Check-list (p. 63) are not included.

Aethaloptera 60, 61, 63, 64, **66,** 68, 75
Amphipsyche 60
angustipennis 79, **98,** 103
astictus 78, **79,** 90, 95, 96

bipunctatus 63, 78, **81,** 84, 87, 90
bisignatus 103
Blepharopus 60

Chloropsyche **66,** 75

dispar 63, 66, **68,** 69, 70, 72, 74
dyakana 75

elisabethae 63, 78, **81,** 84, 87, 90
evanescens 63, 66, 68, **72,** 74

flavipes **79,** 81, 96
fuscus 79, **84**

gracilis 66, 68, **75**
guttatus 79, **98**

hageni 66
hainanensis **79,** 81
hargreavesi 78, **87**

indicus **100,** 103

Macronema 59, 60, 61, 63
Macronematidae 60
Macronematinae 59, **60**
Macronematini 59, 60, 61, 63, 64
maerina 68
maesi 66, **68,** 69
marlieri 78, **87**
maxima 68, 69, 70, **72,** 81
muluensis 79, **87**

nigricornis 78, 79, 81, **90,** 95, 96

ocularis 79, 81, **100,** 103
Oestropsidae 60
Oestropsinae 60
Oestropsis 60, **78**
Oestropsyche 60, 61, 63, **64**
Oestropsychinae 60
Oestropsychini 60, 61

palingenia 64
Paraethaloptera **66,** 68
Phanostoma 60
Polymorphanisus 60, 61, 63, 64, **78**
Primerenca **66,** 68
punctata **75,** 77, 78
pupillatus **81,** 84

quadripunctatus 78, **90**

rossica 63, **74,** 75

scutellaris 92
scutellatus 79, 88, **92**
semperi 78, 79, **92**
sexpunctata 63, 68, **75,** 77
similis 79, 81, 98, **103**
Synoestropsis 59, 63, 64

taoninus 78, **95,** 98
tumidus 79, **95**

umbripes 78, 79, 90, **95,** 96
unipunctus 79, 92, 95, **96**

vitrina 63, **64**

British Museum (Natural History) Monographs on Trichoptera

A revision of the genus *Leptonema* (Trichoptera). M. E. Mosely
1933, 69 pp, 200 text figures, frontispiece, 8vo, £2.20

The Francis Walker types of Trichoptera in the British Museum (Natural History). (Re-described and figured). C. Bretten and M. E. Mosely
1940, ix+248 pp, frontispiece, 122 text figures, 4to £7.75

The Trichoptera (Caddis-Flies) of Australia and New Zealand. M. E. Mosely and D. E. Kimmins
1953, 550 pp, 364 text figures, £10.50

Titles to be published in Volume 41

A revision of the western Palaearctic species of the genus *Meteorus* (Hymenoptera: Braconidae). By T. Huddleston.

A revision of the Old World Polymorphanisini (Trichoptera: Hydropsychidae). By P. C. Barnard.

A review of the genera of Neotropical Encyrtidae (Hymenoptera: Chalcidoidea). By John S. Noyes.

A revision of the British species of *Dendrocerus* Ratzeburg (Hymenoptera: Ceraphronoidea) with a review of their biology as aphid hyperparasites. By N. D. M. Fergusson.

A revision of the Pacific species of *Conocephalus* Thunberg (Orthoptera: Tettigoniidae). By Linda M. Pitkin.

Printed by The Whitefriars Press Ltd, London and Tonbridge

BRITISH MUSEUM
GENERAL
- 6 NOV 1980
LIBRARY
NATURAL HISTORY

Bulletin of the
British Museum (Natural History)

A review of the genera of Neotropical Encyrtidae (Hymenoptera: Chalcidoidea)

John S. Noyes

Entomology series
Vol 41 No 3

30 October 1980

The *Bulletin of the British Museum* (*Natural History*), instituted in 1949, is issued in four scientific series, Botany, Entomology, Geology (incorporating Mineralogy) and Zoology, and an Historical series.

Papers in the *Bulletin* are primarily the results of research carried out on the unique and ever-growing collections of the Museum, both by the scientific staff of the Museum and by specialists from elsewhere who make use of the Museum's resources. Many of the papers are works of reference that will remain indispensable for years to come.

Parts are published at irregular intervals as they become ready, each is complete in itself, available separately, and individually priced. Volumes contain about 300 pages and are not necessarily completed within one calendar year. Subscriptions may be placed for one or more series. Subscriptions vary according to the contents of the Volume and are based on a forecast list of titles. As each Volume nears completion, subscribers are informed of the cost of the next Volume and invited to renew their subscriptions. Orders and enquiries should be sent to:

Publications Sales,
British Museum (Natural History),
Cromwell Road,
London SW7 5BD,
England.

World List abbreviation: *Bull. Br. Mus. nat. Hist.* (Ent.)

© Trustees of the British Museum (Natural History), 1980

ISSN 0524-6431

British Museum (Natural History)
Cromwell Road
London SW7 5BD

Entomology series
Vol 41 No 3 pp 107–253

Issued 30 October 1980

BRITISH
GEN
LIBRARY
NATURAL

A review of the genera of Neotropical Encyrtidae (Hymenoptera: Chalcidoidea)

John S. Noyes

Department of Entomology, British Museum (Natural History), Cromwell Road, London SW7 5BD

Contents

Synopsis . . . 107
Introduction . . . 107
Notes on terms and measurements . . . 108
Abbreviations . . . 111
Key to genera (females) . . . 111
Key to genera (males). . . . 150
Notes on genera . . . 169
Host index . . . 236
Proposed new synonymies . . . 238
Proposed new combinations . . . 238
Lectotype designations . . . 239
Acknowledgements . . . 239
References . . . 239
Index . . . 246

Synopsis

Keys are presented to both sexes of the 148 genera* of Encyrtidae known from the Neotropical region. Notes on each genus are also included; these give information on known world distribution, number of species known, distribution of the genus within the Neotropics, a list of species known from the region, notes on biology, systematic placement and references to original descriptions, redescriptions, revisions or other useful papers. Lectotypes are designated for six species, 19 new genera and 18 new species are described, 16 new generic synonymies and 1 new specific synonymy are proposed.

Introduction

The Neotropical Encyrtidae, probably more diverse than those of any other part of the world (except perhaps Australasia), have been little studied beyond the work of De Santis (1964) and remain poorly known. So far 148 genera* and 380 species are recognized as occurring in the region covered by the present study, i.e. South and Central America, including associated islands and the whole of Mexico, the Antilles from Trinidad to Cuba, and Bermuda; it is very likely that this is only a small proportion of the number that actually occur there. Over 20 000 specimens comprising well over 500 species have been examined in the course of this study; many of these species are undescribed and belong to unknown genera. Nineteen genera are here described as new and as many as twice this number are ignored because of the condition of the material or because they are represented by single specimens. It is possible that a number of the genera considered here as valid may eventually fall in synonymy when more is known about the family as a whole. Some may have already been described by Girault from Australia, since there is a close similarity between the eastern Australian and Neotropical encyrtid faunas, but this

---

Bull. Br. Mus. nat. Hist. (Ent.) **41** (3): 107–253 Issued 30 October 1980

* Note added while this paper was in press. De Santis (1979) also includes the following genera not dealt with in this review: *Asitus* Erdös, *Boucekiella* Hoffer, *Cerapterocerus* Westwood, *Platencyrtus* Ferrière and *Tachinaephagus* Ashmead.

possibility has had to be ignored because of the general unavailability of the Girault type-material. In this review a species has been placed in an already described genus whenever possible, even though it may be considered somewhat out of place there.

An examination of collections received after the first draft of the keys was completed has shown that about a third of the material belonged to genera not included (described or undescribed), or to aberrant species that did not key out as expected (e.g. a *Zeteticontus* sp. with punctate sculpture on the scutellum or a *Metaphycus* sp. with a long exserted ovipositor). It would therefore seem unlikely that anyone using the keys could expect better than a 60 per cent success rate, even if the keys are used correctly. The keys are almost entirely 'artificial' and identifications should be confirmed by reference to original or subsequent generic descriptions. Some of the characters used to separate groups of genera, e.g. relative width of scape or length of funicle segments, may prove to be rather weak, but in such cases the genera concerned have usually been keyed out via both alternatives. More 'natural' keys would be very difficult to use and might be no more reliable than the present ones, since the number of genera and species remaining to be discovered in the Neotropics must be very high, probably at least twenty times greater than the number known at present. The keys are best regarded as an introductory guide to the Neotropical Encyrtidae and will be in constant need of revision as more information and material become available.

The main difficulty in producing a more 'natural' key to encyrtid genera is that, unlike most other chalcidoid families, the Encyrtidae do not easily break down into distinct subgroups. Most past authors have divided the family into three subfamilies: Arrhenophaginae, Antheminae and Encyrtinae, the last-mentioned one containing almost all the known genera. Trjapitzin (1973*a*; 1973*b*) divides the family into two large subfamilies only: Tetracneminae and Encyrtinae, separated mainly on the presence or absence of paratergites. This character may not be a reflection of natural grouping within the Encyrtidae since the genera with paratergites are almost all parasites of Pseudococcidae and these structures may have been evolved more than once as an adaptation to this form of parasitism; however, some genera of Encyrtinae, lacking paratergites, are also parasites of Pseudococcidae. Trijapitzin's study is nevertheless the most detailed to date and I have therefore attempted in this review to place all the included Neotropical genera according to his classification. This is often difficult or impossible because many of the tribes and subtribes are not clearly defined; some are even defined entirely by their biology, so that it is virtually impossible to assign to them genera of which the biology is unknown.

Included in the notes for each genus is the number of known world species and a list of those known from the Neotropics. References are given to original descriptions or redescriptions for most of the species listed, or to revisions or other works where these can be found. Also given are notes on the distribution and biology of each genus. Additional information on the hosts of related genera is given by Tachikawa (1978).

A key to the genera of Encyrtidae supposedly found in the Caribbean, around Cuba, is provided by Alayo & Hernández (1978: 21–27), but this is probably based mainly on descriptions. Some of the genera included (e.g. *Calocerinus* Howard, *Habrolepopteryx* Ashmead) are known from Florida but not from the Neotropics, although it is quite possible that these genera may eventually be found on the islands around Cuba.

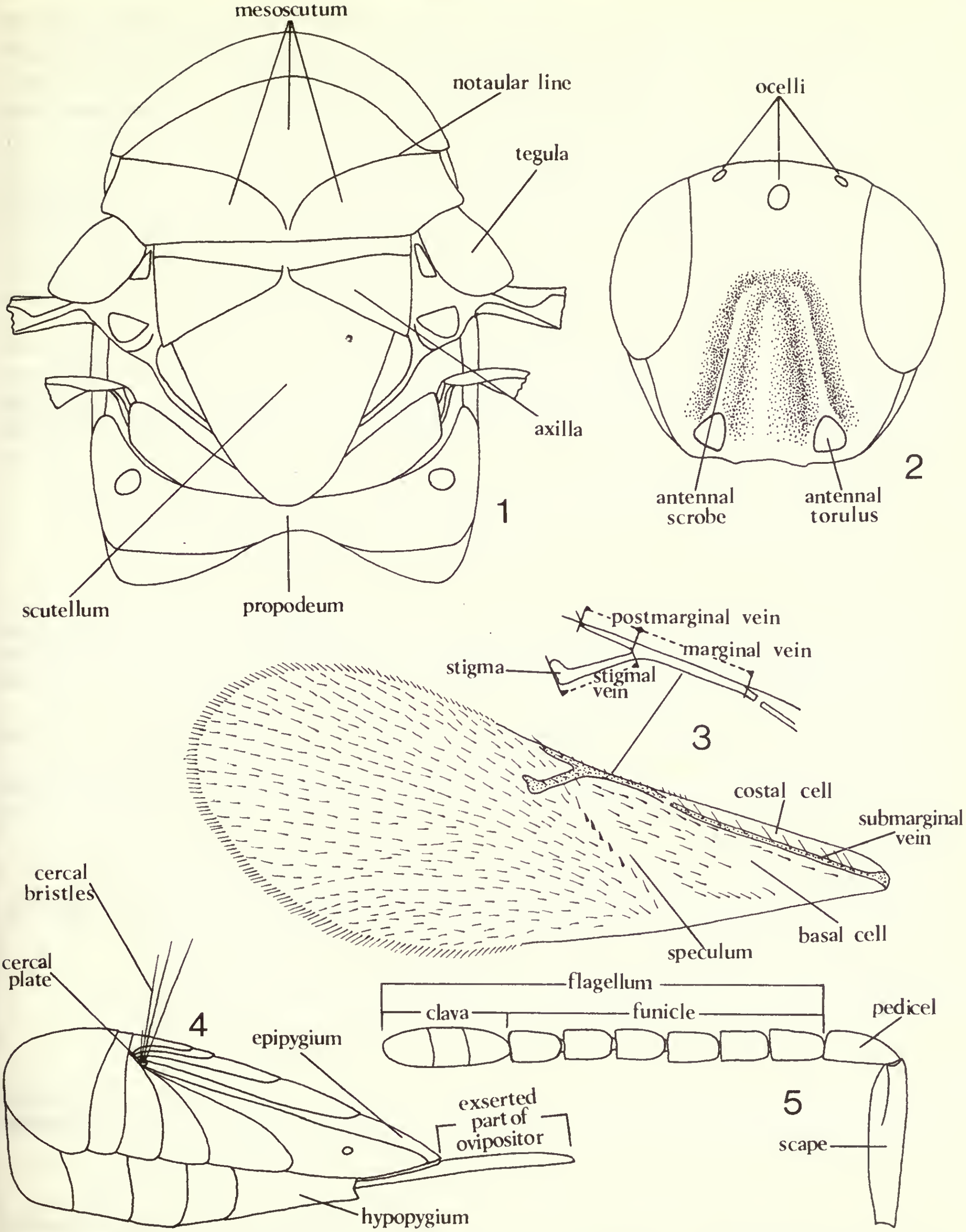
Keys to the genera of Encyrtidae found in other zoogeographical regions have been published by the following authors: Trjapitzin (1971*b*) for the Palaearctic; Trjapitzin & Gordh (1978*a*; 1978*b*) for the Nearctic; and Prinsloo & Annecke (1979) for the Ethiopian Region.

The keys in this review are based on the examination of material in the BMNH, London and on loan from the MLP, Argentina; USNM, Washington; UC, Riverside; CNC, Ottawa; CIBC, Trinidad and PPRI, Pretoria. For an explanation of these abbreviations see p. 111.

Notes on terms and measurements

Head (Figs 2, 5)

Antennal funicle. This does not include the anellus (or false ring-joint of Timberlake, 1922: 168, 172), which may be present or absent but is almost always hidden by the pedicel and


mesoscutum
notaular line
tegula
axilla
scutellum
propodeum
1
ocelli
antennal scrobe
antennal torulus
2
postmarginal vein
marginal vein
stigma
stigmal vein
3
costal cell
submarginal vein
basal cell
speculum
cercal bristles
cercal plate
4
epipygium
exserted part of ovipositor
hypopygium
flagellum
clava
funicle
pedicel
5
scape

Figs 1–5 1, *Homalotylus flaminius* (Dalman) ♀, thorax in dorsal view; 2, generalized encyrtid head in frontal aspect; 3, generalized encyrtid left forewing in dorsal view; 4, generalized encyrtid ♀ gaster, viewed from left side; 5, generalized encyrtid ♀ antenna, left, outer aspect.

invisible in dry-mounted material. In the Encyrtidae the anellus never bears setae, whereas the funicle segments always bear setae (although sometimes very short). The relative length of the setae to the diameter of the segments can be taken directly from the text-figures.

Eye. The measurements of length and breadth are the maximum and minimum diameters respectively; the points from which the measurements are taken should be equidistant from the objective of the microscope (i.e. both in focus simultaneously).

Frontovertex width. The measurements are taken either at the level of the anterior ocellus or at the point where the frontovertex is narrowest, as stated in text.

Head width. The maximum width of the head.

Malar space. The minimum distance between the eye and the mouth margin. The measurement is taken as for the eye.

Malar sulcus. The sulcus joining the lower margin of the eye and mouth margin (see Fig. 2), sometimes absent but usually indicated by a slight change of sculpture.

Mandibles. The dentition can vary as follows: without teeth, with one long curved tooth (Fig. 54), one tooth and a truncation (Fig. 91), two teeth (Figs 40, 55, 56), two teeth and a truncation (Figs 47, 72, 73, 100, 103, 104, 105, although those in Figs 100 and 104 may also be considered tridentate), two teeth and a rudimentary third tooth (Fig. 102), three teeth (Fig. 97) or four teeth (Fig. 46).

OOL. The minimum distance *between* the eye margin and the adjacent posterior ocellus.
POL. The minimum distance *between* the posterior ocelli.

Thorax (Figs 1, 3)

Forewing.

Marginal vein: measured from where the submarginal vein reaches the anterior margin of the wing (as shown in Fig. 3) or from where the anterior edge of the venation at the junction of the submarginal vein and marginal vein is abruptly angled and not from the subapical hyaline break of the submarginal vein.

Postmarginal vein: measured as shown in Fig. 3, its apex usually indicated by a single, relatively long seta.

Speculum (or hairless line): sometimes interrupted in the posterior half or closed near the posterior margin of the wing by from one to several lines of setae on the dorsal surface of the wing.

Stigmal vein (or radial vein of some authors): measured as shown in Fig. 3.

Notaular lines (or parapsidal lines of some authors). These are occasionally difficult to see in dry-mounted material unless viewed under correct light conditions.

Propodeum. The length is measured along the mid-line.

Scutellum. The length is measured along the mid-line; the breadth excludes the axillae.

Gaster (Fig. 4)

Cerci (or pygostyles of some authors). The relative position is measured in dry-mounted material; if it is measured in material which has been in alcohol or slide-mounted, the gaster may be distended and the cerci will be positioned relatively nearer to the apex.

Gonostylus. The third valvula, or ovipositor sheath as seen in slide-mounted material.

Hypopygium (or subgenital plate of some authors). The relative position of the apex measured in dry-mounted material.

Ovipositor. The relative length of the exserted part measured in dry-mounted material. If material has been in alcohol the gaster may be distorted and the ovipositor appear to be relatively more exserted; in this case it would be better to use relative lengths of the exserted parts of the gonostyli.

Ovipositor sheath. The gonostylus as seen in dry-mounted material.

Abbreviations

AMNH, New York	American Museum of Natural History, New York, U.S.A.
BMNH, London	British Museum (Natural History), London, U.K.
CIBC, Trinidad	Commonwealth Institute of Biological Control, Trinidad, West Indies.
CNC, Ottawa	Biosystematics Research Institute, Ottawa, Canada.
MLP, Argentina	Facultad de Ciencas Naturales y Museo, La Plata, Argentina.
PPRI, Pretoria	Plant Protection Research Institute, Pretoria, South Africa.
UC, Riverside	University of California, Riverside, California, U.S.A.
USNM, Washington	National Museum of Natural History, Washington, D.C., U.S.A.
ZI, Leningrad	Zoological Institute, Academy of Sciences, Leningrad, U.S.S.R.

Key to genera (females)

The following genera are not included because the females are unknown, the unique type is missing or their presence in the Neotropics is doubtful: *Atelaphycus, Baeoencyrtus, Echthroplexiella, Parencyrtus, Prionomitus.*

1 Antenna with funicle composed of two to four anelliform segments, clava long and unsegmented (Fig. 6). Tarsi four-segmented . . . ***ARRHENOPHAGUS*** (p. 178)
– Antenna not as above. Tarsi five-segmented 2

2 (1) Funicle four-segmented 3
– Funicle fiv- or six-segmented 7

3 (2) Body dark. Propodeum relatively short centrally, at most one-sixth as long as scutellum 4
– Body orange, or, if dark, then propodeum smooth and relatively long centrally, at least one-third as long as scutellum.
Funicle five-segmented,, but first funicle segment anelliform and almost hidden, giving funicle four-segmented appearance (Fig. 7) 7

4 (3) All funicle segments longer than broad, usually at least twice as long as broad . . ***HOMALOPODA*** (p. 203)
– Funicle segments at most quadrate, usually transverse 5

5 (4) Anterior margin of frontovertex above antennal scrobes sharply margined. Frontovertex and mesoscutum very smooth and shiny. Forewing at least slightly infumate towards base but without distinct hyaline spots. Marginal vein more or less quadrate (Fig. 9).
Stigmal vein sessile. . . . . ***BRACHYPLATYCERUS*** (p. 183)
– Anterior margin of frontovertex above antennal scrobes rounded. Frontovertex with sculpture distinct and deeper than that on mesoscutum. Forewing hyaline, or, if darkened then with several hyaline spots. Marginal vein at least twice as long as broad 6

6 (5) Forewing infuscate with several hyaline spots . . ***PSEUDHOMALOPODA*** (p. 225)
– Forewing hyaline . . . . ***PLAGIOMERUS*** (p. 222)

7 (2, 3) Funicle five-segmented 8
– Funicle six-segmented 28

8 (7) Forewing shortened, hardly reaching base of gaster 9
– Forewing of normal length, at least reaching apex of gaster 10

9 (8) Clava three-segmented. Notaular lines present on mesoscutum. Scutellum of normal shape with rounded apex which extends well beyond posterior margins of axillae (Fig. 8). Cerci situated in basal half of gaster . . . . ***SOLENAPHYCUS*** (p. 230)
– Clava two-segmented. Notaular lines absent. Scutellum almost rectangular with posterior margin hardly extending past posterior margins of axillae (Fig. 11). Cerci situated in apical half of gaster. . . . ***STEMMATOSTERES*** (p. 230)

10 (8) Funicle segments distinctly flattened (the first longer than broad), broadening apically so that sixth is transverse and about one and a half times as broad as and three-quarters as long as first and about one and a half times as broad as scape (Fig. 10) ***ANARHOPUS*** (p. 173)
– Funicle segments cylindrical, first segment often anelliform. 11

11 (10) First funicle segment anelliform, at most one-seventh as long as and about half as wide as second which is subquadrate or longer than broad (Fig. 7). 12
– First funicle segment not anelliform, or, if anelliform then second is at most only slightly longer and broader and distinctly transverse 13

12 (11) Exserted part of ovipositor equal to about one-third length of gaster. Propodeum relatively short centrally, at most one-eighth as long as scutellum . . . . ***APHYCOMASTIX*** (p. 175)
– Ovipositor not or hardly protruding. Propodeum relatively long and shiny centrally, at least one-third as long as scutellum . . . . ***MEROMYZOBIA*** (p. 212)

13 (11) Exserted part of ovipositor equal to at least one-sixth length of gaster, or, if ovipositor not as far exserted then body completely yellow except for one or two dark brown bands on gaster 14
– Ovipositor not or hardly protruding, gaster never yellow with dark bands . . . 20

14 (13) Clava one- or two-segmented . . . . ***TIMBERLAKIA*** (p. 233)
– Clava three-segmented 15

15 (14) First and second funicle segments anelliform, contrasting greatly with third to fifth segments which are subquadrate or longer than broad (Fig. 14) . . . . . ***AMEROMYZOBIA*** (p. 172)
– All funicle segments transverse (occasionally apical segments subquadrate) and gradually lengthening towards apex of antenna, never with first and second segments contrasting as greatly with third as above 16

16 (15) Head and thorax generally shining dark brown, mesopleuron dark brown . . . 17
– Head and thorax yellow or orange, or, if darker then not shiny and with venter and sides of thorax, including mesopleuron, white or yellow or occasionally pale brown . 19

17 (16) Interantennal prominence clothed in dense white setae. Sculpture of scutellum deep and contrasting with the much shallower sculpture of mesoscutum. Mid tibia yellow with two brown bands . . . . ***ARCHINUS*** (p. 176)
– Interantennal prominence clothed in sparse dark setae. Sculpture of scutellum more or less the same as mesoscutum. Mid tibia without brown bands. 18

18 (17) First to fourth funicle segments transverse, fifth quadrate. Legs completely yellow . ***BOTHRIOCRAERA*** (p. 182)
– All funicle segments longer than broad. Legs at least partially darkened . . . ***ARHOPOIDIELLA*** (p. 177)

19 (16) Antenna yellow or orange, unicolorous . . . . . . ***ACEROPHAGUS*** (p. 169)
– Clava with at least the two apical segments white contrasting sharply with the dark brown segments of the funicle . . . . . . ***PSEUDAPHYCUS*** (p. 225)

20 (13) Scutellum long with apical tongue-like extension which overhangs propodeum and curls downwards so that its apex touches posterior margin of propodeum (as in Fig. 12). Frontovertex with a few, very long, conspicuous setae. Clava very large and as wide as long, much wider than funicle. Submarginal vein of forewing with very well-marked triangular expansion near its apex (as in Fig. 13) . . . . . . ***BLANCHARDISCUS*** (p. 182)
– Scutellum of normal form, not overhanging propodeum. Frontovertex with short setae. Clava longer than broad. Submarginal vein occasionally with triangular expansion. 21

21 (20) Malar space very long, about one and a half times length of eye (Fig. 21) . . . ***ARRHENOPHAGOIDEA*** (p. 178)
– Malar space much less than length of eye 22

22 (21) Forewing hyaline, or, if slightly infumate then mesoscutum has more or less complete notaular lines . . . 23

– Forewing more or less uniformly infumate. Mesoscutum entire. Funicle six-segmented, but first funicle segment very short and sometimes hidden by pedicel in dry mounted specimens, giving funicle five-segmented appearance . . . 28

23 (22) Clava four-segmented (Fig. 16) . . . ***TETARTICLAVA*** (p. 232)

– Clava at most three-segmented . . . 24

24 (23) Hypopygium not reaching apex of gaster, at most reaching about two-thirds along gaster. Marginal vein broader than long, or, if slightly longer than broad then colour of head and thorax orange . . . 25

– Hypopygium reaching apex of gaster. Marginal vein longer than broad. Head and thorax dark brown or black . . . 26

25 (24) Mesoscutum with complete notaular lines (Fig. 8). Marginal vein punctiform or slightly longer than broad. Clava apically rounded. Head and thorax orange . . . ***SOLENAPHYCUS*** (p. 230)

– Mesoscutum entire. Marginal vein distinctly broader than long (as in Fig. 126). Clava obliquely truncate (Fig. 15). Head and thorax dark brown . . . ***PENTALITOMASTIX*** (p. 222)

26 (24) Notaular lines complete (difficult to see in dry mounted material). Scutellum matt with much deeper sculpture than mesoscutum . . . ***COCCIDAPHYCUS*** (p. 187)

– Notaular lines absent or indicated anteriorly only. Scutellum shiny with sculpture not noticeably deeper than mesoscutum . . . 27

27 (26) Funicle segments transverse. Forewing with speculum narrow, about same width as length of marginal vein and not interrupted (Fig. 20), but closed on ventral surface of wing by two lines of setae near dorsum. Mandibles tridentate . . . ***ACEROPHAGOIDES*** (p. 169)

– Funicle segments subquadrate or longer than broad. Forewing with speculum broad, much broader than length of marginal vein (Fig. 24) and interrupted by two lines of setae on dorsal surface of wing near dorsum. Mandibles bidentate . . . ***TETRACNEMOIDEA*** (p. 233)

28 (7, 22) Wings shortened, not reaching apex of gaster . . . 29

– Wings of normal length, reaching or exceeding apex of gaster . . . 40

29 (28) Scutellum concave, or with a pit or indentation basally . . . 30

– Scutellum flat or convex, without pit or indentation basally . . . 33

30 (29) Posterior margin of scutellum with line of longer, slightly flattened, upright setae. Scape less than twice as long as broad . . . ***COELASPIDIA*** (p. 188)

– Posterior margin of scutellum with at most two upright setae. Scape at least two and a half times as long as broad . . . 31

31 (30) Outer margins of antennal scrobes rounded. Occipital margin rounded. Scape widest at extreme apex and here with internal and external flanges that completely enclose pedicel. Eyes small, only slightly longer than minimum width of frontovertex . . . ***PHEIDOLOXENUS*** (p. 222)

– Antennal scrobes sharply margined above and at sides. Occipital margin acute. Scape widest in middle or towards base, pedicel not enclosed. Eyes larger, more than twice as long as minimum width of frontovertex . . . 32

32 (31) Scape foliaceously flattened, widest in middle and about three times as long as broad. Mesoscutum uniformly sculptured and convex. Scutellum more or less triangular in shape with apices rounded . . . ***AEPTENCYRTUS*** (p. 171)

– Scape not foliaceously flattened, widest in basal third and about five times as long as greatest width. Mesoscutum distinctly sculptured and convex centrally, completely smooth, shiny and concave laterally. Scutellum as seen from above with sides concave in outline and almost T-shaped . . . ***PELMATENCYRTUS*** (p. 221)

33 (29) Apex of scutellum with distinct tuft of setae . . . 34

– Apex of scutellum without distinct tuft of setae . . . 35

34 (33) Dorsal margin of scape almost straight or uniformly curved. Clava three-segmented. Ovipositor longer than mid tibia . . . . ***CHEILONEURUS*** (p. 184)

– Dorsal margin of scape abruptly bent at middle (Fig. 17). Clava two-segmented. Ovipositor shorter than mid tibia . . . . ***ACROASPIDIA*** (p. 170)

35 (33) First funicle segment longer than pedicel, scape about eight times as long as broad. Rudiments of forewing entirely infuscate . . . . . ***ECTROMATOPSIS*** (p. 194)

– First funicle segment shorter than pedicel, scape at most six times as long as broad. Rudiments of forewing hyaline, suffused with yellow or infuscate at base and apex 36

36 (35) Frontovertex broad, at narrowest point at least half as wide as head 37

– Frontovertex narrower, at narrowest point at most three-fifths as wide as head . . 38

37 (36) Mesoscutum very transverse, about four times as broad as long. Scutellum with apex more or less square. Axillae separated by almost their own width (Fig. 18). Cerci very near base of gaster. Antenna with clava white contrasting with dark funicle segments. Body fairly robust . . . . ***NEODUSMETIA*** (p. 216)

– Mesoscutum not as transverse as above, only slightly broader than long. Scutellum with apex well rounded. Axillae more or less touching (as in Fig. 19). Cerci nearly half way along gaster. Antenna with clava and funicle usually unicolorous or with clava darker than funicle, never with clava paler than funicle. Body dorso-ventrally flattened . ***RHOPUS*** (p. 226)

38 (36) Rudiment of forewing infuscate at base and apex. Mandibles bidentate . . . ***ECTROMA*** (p. 194)

– Rudiment of forewing hyaline or suffused pale yellow. Mandibles not bidentate. . 39

39 (38) Head and thorax completely orange. Forewing rudiment transversely truncate. Mandibles with three acute teeth . . . . . . ***MUCRENCYRTUS*** (p. 213)

– At least thorax dark and metallic. Forewing rudiment more or less rounded, not transversely truncate. Mandibles with one or two teeth and a truncation . . ***OOENCYRTUS*** (p. 217)

40 (28) Scape not more than three times as long as its greatest width 41

– Scape more than three times as long as its greatest width 90

41 (40) Forewing darkened (excluding those species with very small darkened area below marginal vein which hardly extends past apex of stigmal vein, or those where infumation is very weak and almost imperceptible) 42

– Forewing hyaline or with almost imperceptible infumation (also including those species with a very small darkened area below marginal vein which hardly extends past apex of stigmal) 66

42 (41) Funicle segments and clava flattened, at least segments four to six of funicle more or less as wide as clava and almost parallel sided (Figs 22, 23). Funicle segments often articulated near dorsal edge and with long curved ventral process 43

– Funicle segments and clava not flattened, more or less cylindrical or oval in cross-section, or, if appearing slightly flattened then flagellum distinctly club-shaped, the clava much wider than majority of funicle segments which gradually widen towards apex of antenna. Funicle segments articulated in middle and never with ventral process 50

43 (42) Stigmal vein short, at most one-third as long as marginal (Fig. 25). Exserted part of ovipositor at least half as long as gaster . . . . . . ***TETRACNEMUS*** (p. 233)

– Stigmal vein longer, at least half as long as marginal. Exserted part of ovipositor at most one-third as long as gaster in all known South American species 44

44 (43) Forewing with two fuscous fasciae, one arising from marginal vein (incomplete) and other about half way along submarginal, sometimes expanded into a triangular blotch, areas either side of the outermost fascia paler than wing apex. Head and thorax orange or reddish with rather coarse punctate sculpture which gives a silky appearance . . . . ***ANAGYRUS*** (p. 173)

– Infuscate areas of forewing not represented by fasciae, usually more extensive. Head and thorax dark, or, if orange then mesoscutum with shallow reticulate sculpture which is quite shiny 45

45 (44) Marginal vein very short, almost punctiform, stigmal and postmarginal veins both at least four times as long as marginal, stigmal curved towards anterior margin of wing (Figs 26, 27) 46
– Marginal vein relatively longer, at least half as long as stigmal 47

46 (45) Forewing: postmarginal vein distinctly longer than stigmal, costal cell with two or three lines of setae ventrally, upper surface of wing below apex of submarginal vein with at least four lines of normal setae nearly reaching the dorsum (often basal cell completely pilose), basal cell infumate (Fig. 27). Mesoscutum and scutellum entirely of similar sculpture, scutellum at most slightly convex and without distinct tuft or line of setae at apex . . . . ***ZAPLATYCERUS*** (p. 235)
– Forewing: postmarginal vein at most as long as stigmal, costal cell with no more than one complete line of setae ventrally, upper surface of forewing below apex of submarginal vein with at most one line of setae nearly reaching dorsum (usually not reaching half way across wing), some of these flattened and scale-like, basal cell almost completely hyaline (Fig. 26). At least part of mesoscutum or scutellum smooth and shiny, contrasting with sculptured areas, scutellum strongly convex and with tuft or line of setae at apex . . . . ***CHRYSOPLATYCERUS*** (p. 185)

47 (45)* Body dorso-ventrally flattened. Forewing with one or two longitudinal fuscous streaks. Frontovertex usually yellow with median dark stripe . . ***COMPERIELLA*** (p. 189)
– Body robust. Forewing more or less uniformly infuscate from speculum to near apex. Frontovertex unicolorous, occasionally darker between ocelli 48

48 (47) Infuscation of forewing enclosed subapically by darker band, or at least with setae appearing to be more dense in this band (Fig. 30) . . . . . ***ANICETUS*** (p. 174)
– Infuscation of forewing not enclosed subapically by darker band 49

49 (48) Funicle segments broadening towards apex of antenna so that clava is distinctly broader than first three (Fig. 23). Frontofacial ridge prominent and continuous across face . ***HOMOSEMION*** (p. 203)
– Funicle segments slightly but distinctly narrowing towards apex of antenna so that clava is narrower than funicle (Fig. 22). Interantennal prominence confluent with frontovertex so that frontofacial ridge is interrupted in middle . . . . . ***AMMONOENCYRTUS*** (p. 172)

50 (42) Clava entire 51
– Clava three-segmented 52

51 (50) Pedicel apically with several conspicuous very long setae on dorsal surface (Fig. 31). Marginal and postmarginal veins more or less equal in length and stigmal about one and a half times as long as either (Fig. 29). Body colour orange to dark brown. Mandibles bidentate . . . . ***HAMBLETONIA*** (p. 200)
– Pedicel apically without conspicuous setae on dorsal surface. Marginal vein short, almost punctiform and several times shorter than the long postmarginal or stigmal, the latter being strongly curved towards anterior margin of wing (Fig. 28). Body colour shining green or blue. Mandibles tridentate . . . . ***ZARHOPALUS*** (p. 235)

52 (50) First funicle segment about twice as long as pedicel. Forewing with two fuscous bands, one arising at marginal vein and other about half way along submarginal (latter may extend almost to base of wing), apex and base of wing infumate but paler. Mandibles bidentate (as in Fig. 40) . . . . ***ANAGYRUS*** (p. 173)
– First funicle segment at most one and half times as long as, usually shorter than, pedicel. Forewing not infuscate as above. Mandibles rarely bidentate, usually tridentate or quadridentate 53

53 (52) Apex of scutellum and occipital margin between eyes each with two lamelliform setae (Fig. 32) . . . . ***HABROLEPIS*** (p. 199)
– Apex of scutellum and occipital margin without lamelliform setae 54

---

* Note added while this paper was in press: *Cerapterocerus* Westwood (see footnote, p. 107) runs here, but differs from the other included genera in the body not being dorso-ventrally flattened, the forewing having several sharply delimited wedge-shaped hyaline areas and the submarginal vein having a distinct triangular expansion.

54 (53) Apex of scutellum with long tuft of setae, or, if tuft not distinct then exserted part of ovipositor is about half as long as gaster. Forewing more or less uniformly infuscate from bend of submarginal vein to at least near apex (occasionally a broad hyaline band at apex) 55

– Apex of scutellum without long tuft of setae. Ovipositor hidden or if slightly protruding than exserted part is less than one-fifth as long as gaster. Forewing with distinct hyaline spots or band of paler setae between marginal vein and apex . . . 59

55 (54) Mesoscutum usually with median tuft of setae, or, if absent then submarginal vein has small but distinct triangular expansion in apical third below which is a tuft of bristles and infuscate area delimited subapically by darker band. Marginal vein not or hardly longer than stigmal 56

– Mesoscutum without central tuft of setae. Submarginal vein without small triangular expansion. Marginal vein at least slightly longer than stigmal, usually more than twice as long 57

56 (55) Mesoscutum with median tuft of setae. Infuscate area of forewing not delimited by darker band subapically . . . . ***DIVERSINERVUS*** (p. 193)

– Mesoscutum without median tuft of setae. Infuscate area of forewing delimited subapically by darker band (as in Fig. 30) . . . . genus A (p. 169)

57 (55) Marginal vein at most about one and a half times as long as stigmal, postmarginal at least half as long as marginal (Fig. 38), infuscation of forewing very slight. Hypopygium extending at most half way along gaster. Exserted part of ovipositor equal to at least half length of gaster . . . . ***ICEROMYIA*** (p. 204)

– Marginal vein at least twice as long as stigmal and four times postmarginal. Infuscation of forewing strong (Figs 35, 36). If ovipositor is as long as above then hypopygium extends to apex of gaster or infuscation of forewing is very strong 58

58 (57) Epipygium shortened, giving apex of gaster a squared-off appearance (gaster sometimes collapses upwards and inwards laterally giving it a tapered appearance). Hypopygium reaching apex of gaster. Apical hyaline area of forewing, at widest, about equal to half maximum width of wing and with well-delimited strongly curved inner margin, subparallel to wing apex (Fig. 35). Exserted part of ovipositor always at least half as long as gaster . . . . ***PROCHILONEURUS*** (p. 223)

– Epipygium long and triangular giving gaster a gradually tapered appearance. Hypopygium at most reaching about two-thirds along gaster. Forewing without apical hyaline area, or, if area present then its inner margin not well delimited but usually wedge-shaped, not subparallel to apical margin (Fig. 36). Ovipositor usually more or less hidden, occasionally exserted part long, but always shorter than half length gaster . . . . ***CHEILONEURUS*** (p. 184)

59 (54) Forewing with several hyaline spots on margin. Head triangular in side view with planes of face and frontovertex forming a strongly acute angle (Fig. 33) ***ANABROLEPIS*** (p. 172)

– Forewing without hyaline spots, generally uniformly infuscate or gradually becoming paler towards apex or with one or more transverse, often interrupted, hyaline fasciae. Head in side view more or less gradually curved (except in *Hemaenasius* which has base of forewing infumate and gradually fading towards wing apex) . . . 60

60 (59) First funicle segment distinctly transverse, or, if subquadrate then at most half as long as pedicel 61

– First funicle segment longer than broad, or, if subquadrate then at least two-thirds as long as pedicel 65

61 (60) Forewing more or less uniformly infuscate or gradually becoming paler towards apex, without hyaline bands or band of paler setae between marginal vein and apex. Pronotum more or less same colour as mesoscutum 62

– Forewing with at least one hyaline band or a band of paler setae distal of marginal vein. Pronotum often paler than mesoscutum 64

62 (61) Occipital margin sharp. Forewing with basal cell totally infumate. Hypopygium reaching apex of gaster. Eyes reaching occipital margin. Head and thorax shining black, blue or green 63

– Occipital margin not sharp. Forewing with basal cell hyaline. Hypopygium not reaching apex of gaster. Eyes separated from occipital margin by distance about the same as diameter of posterior ocellus (Fig. 34). Head and thorax brown . . . . . ***HUNTERELLUS*** (p. 204)

63 (62) Head more or less lenticular, usually with thimble-punctured sculpture. Flagellum club-shaped and clava as least as long as funicle (Fig. 62). Costal cell with at least two or three lines of setae dorsally . . . . ***AENASIUS*** (p. 170)

– Head not lenticular, often abruptly bent at level with top of antennal scrobes, frontovertex smooth and shiny. Flagellum not club-shaped and clava slightly shorter than funicle (Fig. 51). Costal cell dorsally with at most a few setae at apex . . ***HEMAENASIUS*** (p. 202)

64 (61) Femora as well as tibia with contrasting light and dark bands or areas. Forewing: basal cell with setae on dorsal surface extremely dense, as dense as in centre of wing, distal side of infuscate area with a distinct band of paler setae . . . . [***Dicarnosis***] ***blanchardi*** De Santis (p. 193)

– At most only mid and hind tibiae with pronounced dark bands. Forewing: basal cell usually with setae on dorsal surface markedly less dense than, rarely as dense as, in centre of wing, distal side of infuscate area without band of paler setae . . . ***METAPHYCUS*** (p. 212)

65 (60) Dorsum of thorax, frontovertex and mesopleura with dense punctiform sculpture. Upper surface of basal cell with setae as dense as in centre of wing. Eyes distinctly hairy. Mandibles with two teeth and a truncation . . . . ***COMPERIA*** (p. 189)

– Dorsum of thorax almost smooth, with shallower less dense sculpture. Upper surface of basal cell with setae much less dense than centre of wing and usually with bare area. Eyes not distinctly hairy. Mandibles usually with three acute teeth . . . . ***MICROTERYS*** (p. 213)

66 (41) All funicle segments longer than broad 67

– Not all funicle segments longer than broad. 71

67 (66) First funicle segment at most one and a half times as long as broad. Mandibles tridentate or with one tooth and a broad truncation or without teeth . . . 68

– First funicle segment at least twice as long as broad. Mandibles bidentate (Fig. 40) . 69

68 (67) Scutellum rather convex and with similar sculpture to mesoscutum. Pedicel subequal in length to first funicle segment, clava at most as long as the combined lengths of funicle segments four to six (Fig. 37). . . . . . . ***GAHANIELLA*** (p. 197)

– Scutellum flat with deeper sculpture than mesoscutum. Pedicel longer than first funicle segment, clava nearly as long or longer than the funicle (as in Fig. 39) . . . ***COCCIDENCYRTUS*** (p. 188)

69 (67) Sculpture of frontovertex shallow and finer so that it is distinctly shiny, never orange or yellow, usually black . . . . ***APOANAGYRUS*** (p. 176)

– Sculpture on frontovertex coarsely punctate giving it a matt or silky appearance, never shiny and often yellow or orange 70

70 (69) Postmarginal vein shorter than stigmal (Figs 70, 71). Face usually with conspicuous, moderately dense white setae. Sculpture on frontovertex irregular and silky in appearance . . . . ***ANAGYRUS*** (p. 173)

– Postmarginal vein at least about twice as long as stigmal. Pale setae present on head, but never conspicuous. Sculpture on frontovertex more regular and polygonal, not silky in appearance . . . . ***GYRANUSOIDEA*** (p. 199)

71 (66) Apex of scutellum with a tuft of setae, or, if this is inconspicuous then normally at least posterior half of mesoscutum with silvery white setae which contrast with the darker colour of the mesoscutum, scutellum with dark setae. Usually at least anterior one-third of mesoscutum with fine striate sculpture. Frontovertex shiny, thorax and head dark . . . . ***ZAOMMA*** (p. 235)

– Apex of scutellum without tuft of setae (in majority of species only two upright setae). Mesoscutum without silvery setae, or, if these are present and contrast with dark colour of mesoscutum then scutellum also has silvery setae, frontovertex is matt and thorax and head usually have paler areas 72

72 (71)* Body distinctly dorso-ventrally flattened. Cerci situated about half way along gaster. Ovipositor not protruding. Mandibles long and narrow with teeth of equal length . ***RHOPUS*** (p. 226)

– Body robust, or if flattened, then cerci are situated near base of gaster (mandibles may be bidentate, but here upper tooth is very long and curved and lower tooth short) or mandibles are clearly tridentate and the exserted part of the ovipositor is equal to at least one-quarter length of gaster 73

73 (72) Clava two-segmented 74

– Clava three-segmented 75

74 (73) Frontovertex with distinct sculpture. Antennal scrobes moderately impressed and horseshoe shaped. Exserted part of ovipositor equal to about one-quarter length of gaster and more or less straight, not curved downwards . . ***TANYENCYRTUS*** (p. 231)

– Frontovertex highly polished. Antennal scrobes absent or represented by an extremely shallow groove much shorter than length of torulus (as in Fig. 41). Exserted part of ovipositor equal to at least about half length of gaster and distinctly downcurved . ***SHENAHETIA*** (p. 227)

75 (73) Body foliaceously dorso-ventrally flattened (Fig. 42). Exserted part of ovipositor at least one-third length of gaster and with sheaths bilaterally flattened. . ***MARIOLA*** (p. 210)

– Body robust. Ovipositor not exserted as much as above, or if so, then sheaths are cylindrical 76

76 (75) Head at least with some orange or yellow areas, or, if head completely darkened then matt in appearance and pronotum paler than mesoscutum 77

– Head dark and shiny, or, if head not distinctly shiny then pronotum the same colour as mesoscutum 79

77 (76) Clava apically rounded . . . . ***METAPHYCUS*** (p. 212)

– Clava obliquely truncate (Fig. 43, cf. Fig. 44) 78

78 (77) Exserted part of ovipositor as long as at least half length of gaster. At least mesoscutum dark and metallic. Marginal vein at least twice as long as broad (as in Fig. 38) . ***ICEROMYIA*** (p. 204)

– Ovipositor not or hardly visible. Thorax completely orange; marginal vein punctiform (Fig. 150) . . . . ***BENNETTISCA*** (p. 180)

79 (76) Pedicel and all funicle segments subequal in length and breadth and subquadrate or longer than broad (as in Fig. 37), frontovertex at narrowest point at least three-eighths head width.

Mandibles without teeth or with one tooth and a broad truncation . . . ***GAHANIELLA*** (p. 197)

– Pedicel distinctly longer than first funicle segment, or, if not then funicle distinctly broadens apically or the frontovertex at its narrowest point is less than one-third head width and the funicle segments are distinctly not quadrate 80

80 (79) Clava shorter than funicle, at most as long as the combined lengths of funicle segments three to six 81

– Clava almost as long or longer than funicle, at least as long as the combined lengths of funicle segments two to six 86

---

* Note added while this paper was in press. *Asitus* Erdös, *Boucekiella* Hoffer and *Platencyrtus* Ferrière (see footnote on p. 107) all run here but may be distinguished by having an extremely flattened leaf-like body. *Asitus* has bidentate mandibles, a longitudinally divided pronotum and the forewing with a very long marginal fringe, at least one-fifth maximum width of wing; *Boucekiella* has tridentate mandibles, as does *Platencyrtus*, and has the submarginal vein with a subapical triangular expansion (absent in *Platencyrtus*) and the ovipositor exserted for a length equal to one-third of gaster (the ovipositor is not exserted in *Platencyrtus*).

81 (80) Head with large, shiny bottomed thimble-punctures. Scutellum convex with rough sculpture. Hypopygium not reaching apex of gaster . . ***HELMECEPHALA*** (p. 200)
– Head without large thimble-punctures, or if present (*Zeteticontus*), then scutellum is quite flat, smooth and shiny, and the hypopygium reaches apex of gaster . . 82

82 (81) Eyes over-reaching occipital margin and with very short indistinct hairs. Frontovertex with inconspicuous hairs. Ocelli usually forming a distinctly acute angle. Scutellum convex, usually with deep sculpture, but occasionally smooth.
Mandibles with one or two teeth and truncation . . . ***OOENCYRTUS*** (p. 217)
– Eyes not over-reaching occipital margin, or, if so then with conspicuous hairs. Frontovertex with long, conspicuous hairs. Ocelli usually forming a right or obtuse angle, or, occasionally a slightly acute angle. Scutellum more or less flat, usually smooth and shiny, without distinct sculpture 83

83 (82) Eyes separated from occipital margin, which is more or less rounded, by a distance about same as diameter of posterior ocellus (Fig. 34) . ***HUNTERELLUS*** (p. 204)
– Eyes separated from occipital margin, which is sharp, by much less than half diameter of posterior ocellus 84

84 (83) Mandibles with three acute teeth. Hypopygium reaching apex of gaster . . . ***ZETETICONTUS*** (p. 236)
– Either the hypopygium does not reach apex of gaster, or mandibles are bidentate with upper tooth long and curved and lower tooth short (Figs 55, 56) 85

85 (84) Mandibles tridentate. Propodeum at most one-eighth as long as scutellum and without distinct sculpture centrally . . . . ***EXORISTOBIA*** (p. 196)
– Mandibles bidentate (Figs 55, 56). Propodeum at least one-sixth as long as scutellum and with distinct sculpture centrally (as in Fig. 121) . . ***RHYTIDOTHORAX*** (p. 226)

86 (80) Mesoscutum with distinct longitudinally striate sculpture . . . ***DESOBIUS*** (p. 192)
– Mesoscutum not with striate sculpture 87

87 (86) Scutellum with coarser sculpture than mesoscutum, giving it a matt (or less shiny) appearance in contrast with the shiny appearance of the mesoscutum . . . 88
– Scutellum with similar sculpture to mesoscutum, both shiny 89

88 (87) Mandibles quadridentate (Fig. 46). Mid tibia completely yellow without dark bands . ***ADELENCYRTUS*** (p. 170)
– Mandibles with one or two teeth and a truncation, mid tibia often brown, or, yellow with dark bands . . . . ***COCCIDENCYRTUS*** (p. 188)

89 (87) Funicle and clava unicolorous, brown . . . . . ***COELOPENCYRTUS*** (p. 189)
– Funicle yellow, contrasting with the brown clava . . . . [?***Coccidencyrtus maculicornis*** (Blanchard)] (p. 188)

90 (40) Hind tibia distinctly flattened (Fig. 45). Forewing with central oval fuscous spot or fascia. Mesoscutum with notaular lines (one specimen from Panama which may belong here has mesoscutum entire and clava obliquely truncate) . ***MOORELLA*** (p. 213)
– Hind tibia not flattened, or, if flattened then mesoscutum entire or forewing hyaline . 91

91 (90) Eyes nearly reaching base of mandible, malar space at most about one-fifth length of eye (usually not more than one-tenth), apex of clypeus slightly produced outwards (Fig. 48).
Notaular lines completely absent. Head and thorax completely metallic green or blue. Clava obliquely truncate . . . . . . ***PARABLASTOTHRIX*** (p. 218)
– Malar space much longer than above and clypeus normal 92

92 (91) Forewing darkened (excluding those species with small fuscous spot below marginal vein which does not or hardly extends past apex of stigmal vein, or, with forewing suffused pale yellow) 93
– Forewing hyaline (including those species with small fuscous spot below marginal vein which does not or hardly extends past apex of stigmal vein, or with forewing suffused pale yellow) 145

93 (92) Apex of scutellum with tuft of long setae at apex 94

– Apex of scutellum without tuft of setae (usually two erect setae in most species) 96

94 (93) Marginal vein short, postmarginal and stigmal veins long, at least about twice as long as marginal (Fig. 49). Mandibles without teeth ***ENCYRTUS*** (p. 195)

– Marginal vein at least twice as long as stigmal (Figs 35, 36). Mandibles with at least two acute teeth 95

95 (94) Epipygium shortened giving gaster a truncate appearance (gaster sometimes collapses upwards and inwards laterally giving it a tapered appearance). Hypopygium reaching apex of gaster. Apical hyaline area of forewing, at widest, equal to about half maximum width of wing and with a well-delimited, strongly curved inner margin subparallel to wing apex (Fig. 35). Exserted part of ovipositor always equal to at least half length of gaster ***PROCHILONEURUS*** (p. 223)

– Epipygium long and triangular giving it a gradually tapered appearance. Hypopygium at most reaching two-thirds along gaster. Forewing without apical hyaline area, or, if area present then its inner margin not well delimited but usually wedge-shaped, not subparallel to apical margin (Fig. 36). Ovipositor generally more or less hidden, occasionally exserted part long, but always shorter than half length of gaster.. ***CHEILONEURUS*** (p. 184)

96 (93) Exserted part of ovipositor at least one-fifth as long as gaster 97

– Exserted part of ovipositor at most one-sixth as long as gaster 108

97 (96) Mesoscutum with complete notaular lines (as in Fig. 1) 98

– Mesoscutum entire or with notaular lines indicated in anterior half only 99

98 (97) Clava apically rounded. Mid and hind tibiae each yellow with two brown rings ***TYNDARICHOIDES*** (p. 234)

– Clava apically obliquely truncate (as in Fig. 50). Mid and hind tibiae without dark rings 99

99 (97, 98) Infuscation of forewing restricted to median oval spot below stigmal and marginal veins, occasionally moderately large and extending over whole of central third of wing, but at least basal and apical thirds of wing hyaline. At least one funicle segment quadrate or transverse. Notaular lines usually anteriorly indicated. Exserted part of ovipositor equal to at least half length of gaster. Hypopygium reaching apex of gaster 100

– Infuscation of forewing usually more extensive (less extensive in some genera) and often pale, or, if similar to above then all funicle segments longer than broad. Notaular lines completely absent. Exserted part of ovipositor occasionally as long or longer than above. Hypopygium sometimes reaching apex of gaster 102

100 (99) Notaular lines more or less complete, at least nearly reaching posterior margin of mesoscutum (as in Fig. 1). Clava solid and obliquely truncate (as in Fig. 50) ***HOMALOTYLUS*** (p. 203)

– Either notaular lines are indicated at anterior margin of mesoscutum only, or, clava is segmented and apically rounded and notaular lines reach at most two-thirds across mesoscutum 101

101 (100) Ovipositor sheaths, in side view, distinctly tapering towards apex and relatively deep at apex of gaster, at least one and a half times as deep as maximum breadth of scape ***AZTECENCYRTUS*** (p. 180)

– Ovipositor sheaths completely cylindrical and not tapering, at apex of gaster about half as deep as maximum breadth of scape ***CIRRHENCYRTUS*** (p. 187)

102 (99) Forewing with a large, hyaline, triangular spot on anterior margin confluent with apices of postmarginal and stigmal veins and joined by a slightly curved hyaline band to a similar spot on the opposite side of the wing (Fig. 52). Hind tibia yellow with two dark bands ***NEOCOCCIDENCYRTUS*** (p. 216)

– Forewing without hyaline areas as above. Hind tibia at most with one brown band 103

103 (102) Occipital margin rounded 104

– Occipital margin sharp 105

104 (103) Epipygium broadly rounded apically giving gaster truncate apearance. Exserted part of ovipositor slightly shorter than gaster. Body more or less orange . . . . . ***CALLIENCYRTUS*** (p. 183)

– Epipygium elongate and triangular, overhanging base of exserted part of ovipositor. Exserted part of ovipositor longer than gaster. Body dark metallic green . . ***DELOENCYRTUS*** (p. 191)

105 (103) Ovipositor sheaths distinctly flattened, together more than twice as deep as broad in dorsal view . . . . ***HEMENCYRTUS*** (p. 202)

– Ovipositor sheaths cylindrical or oval in cross section. 106

106 (105) Stigmal vein longer than marginal. Infuscation of forewing weak, not extending past stigmal vein towards wing apex. Hypopygium extending about half way along gaster. Mesoscutum orange with contrasting dark brown setae . ***APHYCOMORPHA*** (p. 175)

– Stigmal vein short, less than one-third as long as marginal (as in Fig. 35). Infuscation of forewing stronger and extending past stigmal vein almost to wing apex. Hypopygium reaching apex of gaster. Mesoscutum with pale (usually white) setae 107

107 (106) All funicle segments longer than broad. Gaster long and tapered, longer than thorax. ***TINEOPHOCTONUS*** (p. 234)

– At least one funicle segment quadrate or transverse. Gaster apically truncate and shorter than thorax . . . . ***PROCHILONEURUS*** (p. 223)

108 (96) All funicle segments longer than broad 109

– Not all funcle segments longer than broad 121

109 (108) Mesoscutum with more or less complete notaular lines (Fig. 1). Clava obliquely truncate (Fig. 50) . . . . ***HOMALOTYLUS*** (p. 203)

– Mesoscutum without notaular lines, clava apically rounded 110

110 (109) Forewing with one or two distinct, dark sometimes incomplete fasciae (occasionally dark spot beyond second fascia and confluent with it). First funicle segment as long or longer than pedicel 111

– Either forewing without distinct dark fasciae, or, first funicle segment distinctly shorter than pedicel 115

111 (110) Cerci in apical third of gaster 112

– Cerci in basal third of gaster 113

112 (111) Axillae very convex and very prominent, raised about level of scutellum, scutellum posteriorly raised above level of mesoscutum. Scape reaching well above level of vertex. First funicle segment about three times as long as pedicel. Eyes separated from occipital margin by distance greater than diameter of posterior ocellus. Occipital margin strongly concave in dorsal view. Forewing with two dark fasciae, basal cell and costal cell almost completely naked . . . . . . ***HEXACLADIA*** (p. 203)

– Axillae almost flat and on a level with scutellum which is not posteriorly raised. Scape not reaching further than anterior ocellus. First funicle segment less than twice as long as pedicel. Eyes separated from occipital margin by distance less than diameter of posterior ocellus. Occipital margin only slightly concave in dorsal view. Forewing with only one dark fascia, basal and costal cells hairy . ***PRIONOMASTIX*** (p. 223)

113 (111) Postmarginal vein longer than stigmal . . . . . . ***LEPTOMASTIDEA*** (p. 206)

– Postmarginal vein shorter than stigmal (as in Figs 70, 71) 114

114 (113) Malar space relatively short, less than one-quarter length of eye. Scape cylindrical, about eight times as long as broad. Forewing with only one fascia, this situated about half way along submarginal vein. Body black . . . . . ***ANATHRIX*** (p. 174)

– Malar space longer, nearly half as long as eye. Scape distinctly broadened and flattened, just greater than three times as long as broad. Forewings with two dark fasciae, one two-thirds along submarginal vein and the other at marginal vein. Head and thorax orange . . . . ***ANAGYRUS*** (p. 173)

115 (110) Infuscation of forewing restricted to single wedge-shaped streak (Fig. 57) or triangular mark arising at or near apex (Fig. 53). Thorax green 116

– Infuscation not triangular or wedge-shaped, or, if similar to above then thorax completely orange 117

116 (115) Forewing with marginal vein about seven times as long as broad, stigmal and postmarginal veins both longer than marginal (Fig. 53). Pedicel less than half as long as first funicle segment. Occipital margin acute. Mandibles bidentate . . . ***ERICYDNUS*** (p. 195)

– Forewing with marginal vein at most five times as long as broad, stigmal and postmarginal veins shorter than marginal (Fig. 57). Pedicel less than half as long as first funicle segment. Occipital margin rounded. Mandibles tridentate . . . ***PARECHTHRODRYINUS*** (p. 221)

117 (116) Marginal form punctiform, stigmal vein at least twice as long as marginal, postmarginal vein short or absent (as in Fig. 90). Infuscation restricted to large, more or less oval spot extending completely across wing below marginal vein ***MUCRENCYRTUS*** (p. 213)

– Marginal vein at least twice as long as broad, or nearly as long as stigmal, if stigmal longer than marginal then postmarginal long and distinct. Infuscation usually more extensive 118

118 (117) Occipital margin more or less rounded. Head triangular in side view (as in Fig. 33). Forewing with distinct hyaline fascia distal to marginal vein, postmarginal vein very short or absent (Fig. 52) . . . . ***NEOCOCCIDENCYRTUS*** (p. 216)

– Occipital margin acute. Head rounded in side view. Forewing never with hyaline fascia, postmarginal vein long 119

119 (118) Eyes not distinctly hairy. Forewing with speculum interrupted in lower half (as in Figs 70, 71). First funicle segment at least twice as long as pedicel. Head and thorax orange ***LEPTOMASTIX*** (p. 206)

– Eyes distinctly hairy, speculum not interrupted. First funicle segment not or hardly longer than pedicel. Head and thorax dark, from green to black 120

120 (119) Ovipositor usually visible with sheaths bilaterally flattened. Mandibles broad and tridentate, lower teeth subequal in length, upper tooth often short and indistinct. Scutellum either flat with a distinct translucent apical flange (Fig. 60) or very convex with flange indistinct or absent. Hypopygium reaching apex of gaster . . . ***HEMENCYRTUS*** (p. 202)

– Ovipositor usually hidden, but if visible then sheaths are cylindrical. Mandibles unidentate (Fig. 54) or bidentate with upper tooth long and curved, distinctly longer than the short lower tooth (Figs 55, 56). Scutellum always fairly flat and without apical translucent flange (although occasionally a flange is present but this is not translucent and is distinctly sculptured). Hypopygium not reaching apex of gaster, often quite long laterally and nearly reaching apex, but deeply incised centrally . ***RHYTIDOTHORAX*** (p. 226)

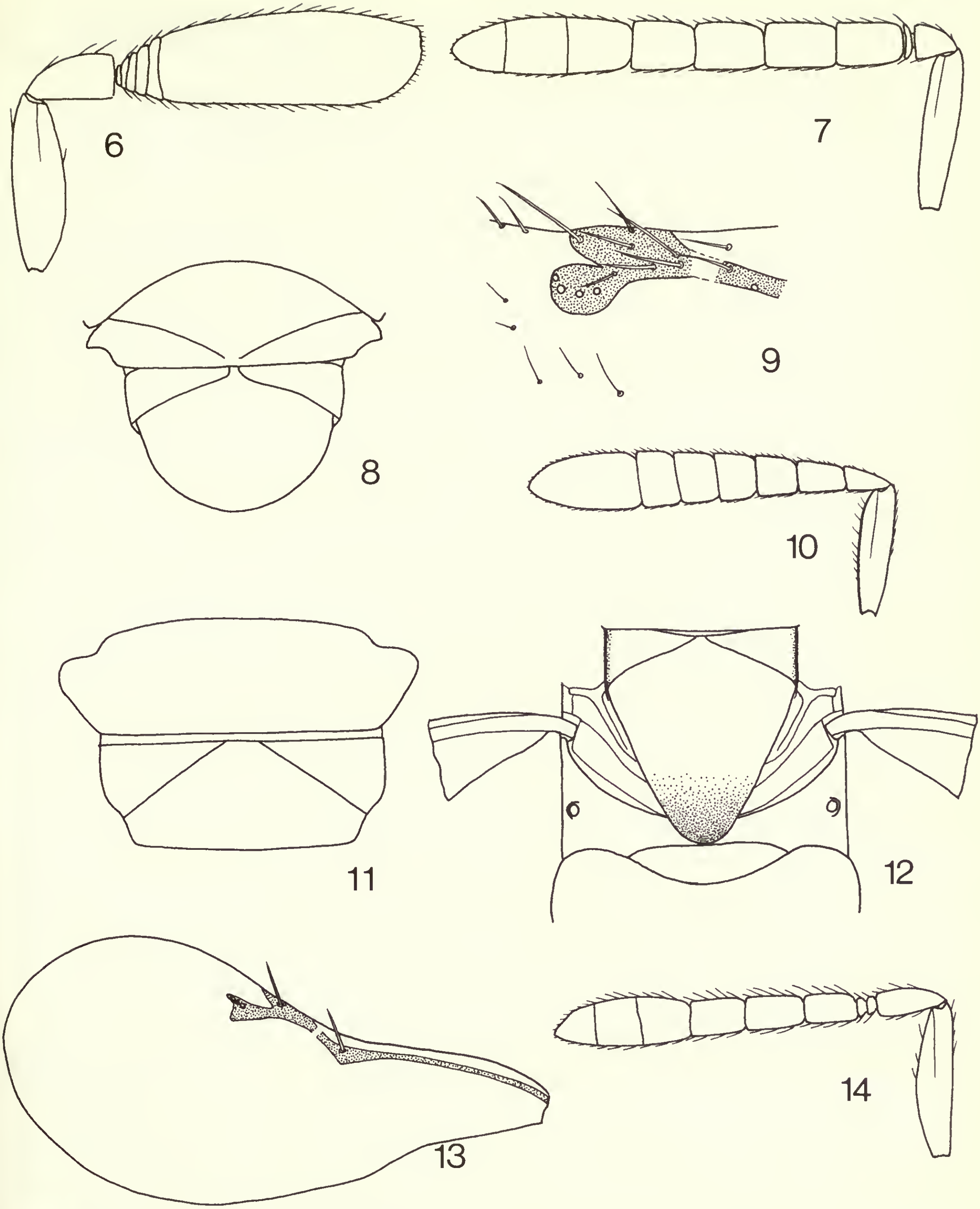
121 (108) Funicle segments flattened, distinctly broadest in middle of funicle and gradually tapering towards base and apex (Fig. 66). Forewing with patch of golden setae situated in centre just below marginal vein and bordered along inner and outer margins by dark setae, basal cell completely naked. Marginal vein long and subequal in length to the long postmarginal, stigmal vein distinctly shorter than either . . ***ANUSIOPTERA*** (p. 175)

– Funicle segments subequal in width or broadening towards clava, never with segments widest in middle, forewing not as above 122

122 (121) Forewing with one or two hyaline fasciae, or a pair of opposite triangular hyaline spots (sometimes indistinct) distal to stigmal vein, apex of forewing infuscate. Mesoscutum entire 123

– Forewing without hyaline fasciae, or triangular spots distal to stigmal vein, or, if fascia of paler setae present then notaular lines complete or at least extending half way across mesoscutum with apex of forewing hyaline 127

123 (122) Occipital margin rounded. Forewing with infuscation on proximal side of hyaline spots, which often appear joined, sometimes very weak. Scutellum flat with sculpture distinctly deeper than that on mesoscutum . . . . . ***ANABROLEPIS*** (p. 172)



Figs 6–14 6, *Arrhenophagus chionaspidis* Aurivillius ♀, right antenna, outer aspect; 7, *Aphycomastix annulata* De Santis ♀, left antenna, outer aspect; 8, *Solenaphycus vianai* De Santis ♀, mesoscutum and scutellum in dorsal view; 9, *Brachyplatycerus* sp. ♀, venation of left forewing; 10, *Anarhopus sidneyensis* Timberlake ♀, left antenna, outer aspect; 11, *Stemmatosteres apterus* Timberlake ♀, mesoscutum and scutellum in dorsal view; 12, *Blanchardiscus* sp. ♂, scutellum and propodeum in dorsal view; 13, *Blanchardiscus* sp. ♂, outline of left forewing and venation; 14, *Ameromyzobia aphelinoides* Girault ♀, left antenna, outer aspect.

– Occipital margin acute. Forewing with infuscation on proximal side of hyaline areas strong. If sculpture on scutellum distinctly deeper than that of mesoscutum then scutellum convex 124

124 (122) Mid tibial spur of unusual form, very flattened and apically rounded, spatulate (Fig. 61) first two segments of funicle very short, at most half as long as the remainder which are subequal in length and breadth . . . . . . ***DESANTISELLA*** (p. 191)

– Mid tibial spur of normal form, gradually tapering with pointed apex. Antennae not as above 125

125 (124) Hind tibia distinctly flattened, not or hardly more than four times as long as broad (Fig. 64) . . . . ***CARABUNIA*** (p. 184)

– Hind tibia not or hardly flattened, at least six times as long as broad 126

126 (125) Forewing with two opposite, more or less triangular hyaline spots ***HOPLOPSIS*** (p. 204)

– Forewing with one or two hyaline fasciae, if two present then outer one often interrupted . . . . ***MICROTERYS*** (p. 213)

127 (122) Forewing with longitudinal wedge-shaped streak, broadest at apex of wing, submarginal vein with triangular expansion in apical third (sometimes indistinct) (Fig. 57). Occipital margin more or less rounded . . . ***PARECHTHRODRYINUS*** (p. 221)

– Forewing without longitudinal wedge-shaped streak, submarginal vein without triangular expansion. Occipital margin sharp 128

128 (127) Scutellum, mesoscutum and frontovertex with deep thimble-punctures . . . 129

– At most either head or dorsum of thorax with thimble-punctures 130

129 (128) At least first funicle segment longer than broad, funicle segments shortening towards clava, clava at most as long as combined lengths of funicle segments three to six . ***BOTHRIOTHORAX*** (p. 182)

– All funicle segments distinctly transverse and lengthening towards clava, clava as long or longer than funicle 130

130 (128, 129) First funicle segment distinctly longer than broad. Clava apically rounded . . 131

– Either first funicle segment transverse or clava obliquely truncate 134

131 (130) Forewing with distinct dark fascia situated about half way along submarginal vein, remainder of forewing hyaline . . . . ***ANATHRIX*** (p. 174)

– Forewing without distinct dark fascia, more generally darkened or with fascia arising at marginal vein and gradually becoming paler towards wing apex 132

132 (131) Cerci situated in apical third of gaster. Mandibles with one tooth and a broad truncation . . . . ***PRIONOMASTIX*** (p. 223)

– Cerci situated in basal half of gaster. Mandibles unidentate, bidentate or tridentate . 133

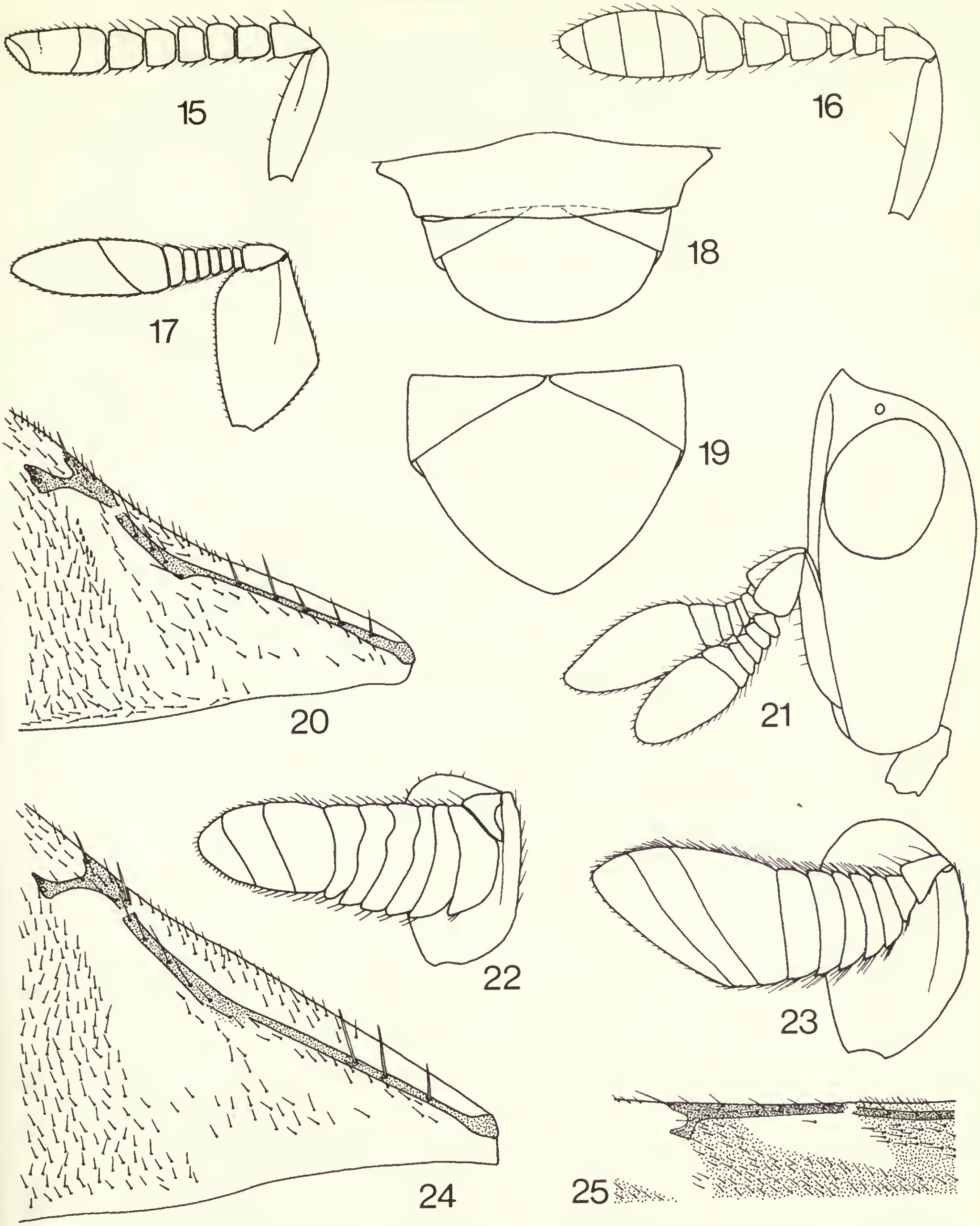
133 (132)* Ovipositor usually visible with sheaths bilaterally flattened. Mandibles broad and tridentate, lower teeth subequal in length, upper tooth often short and indistinct. Scutellum either flat with a distinct translucent apical flange (Fig. 60) or very convex with flange indistinct or absent. Hypopygium reaching apex of gaster . . . ***HEMENCYRTUS*** (p. 202)

– Ovipositor usually hidden, but if visible then sheaths are cylindrical. Mandibles unidentate (Fig. 54) or bidentate with upper tooth long and curved, distinctly longer than the short lower tooth (Figs 55, 56). Scutellum always fairly flat and without apical translucent flange (although occasionally flange is present but distinctly sculptured and not translucent). Hypopygium not reaching apex of gaster, often quite long laterally and nearly reaching apex, but deeply incised medially . . . ***RHYTIDOTHORAX*** (p. 226)

134 (130) Apex of clava rounded. Hypopygium rarely extending further than half way along gaster and never to near apex 135

---

* Note added while this paper was in press. *Tachinaephagus* Ashmead may run here but differs from *Rhytidothorax* in having strongly tridentate mandibles and the hypopygium reaching the apex of the gaster, and from *Hemencyrtus* in having a smooth convex scutellum with the apical flange very small, almost absent, and the eyes separated from the occipital margin by about half the diameter of an ocellus (very nearly touching occipital margin in *Hemencyrtus*).



Figs 15–25 15, *Pentalitomastix plethoricus* Caltagirone ♀, left antenna, outer aspect; 16, *Tetarticlava yoshimotoi* sp. n. ♀, left antenna, outer aspect; 17, *Acroaspidia myrmicoides* Compere & Zinna ♀, left antenna, outer aspect; 18, *Neodusmetia sangwani* (Subba Rao) ♀, mesoscutum and scutellum in dorsal view; 19, *Rhopus desantisellus* Ghesquière ♀, scutellum in dorsal view; 20, *Acerophagoides* sp. ♀, base of left forewing, upper surface; 21, *Arrhenophagoidea* sp. ♀, head (slightly collapsed) viewed from left side; 22, *Ammonoencyrtus bonariensis* (Brèthes) ♀, left antenna, outer aspect; 23, *Homosemion bennetti* Annecke ♀, left antenna, outer aspect; 24, *Tetracnemoidea pretiosa* (Timberlake) ♀, base of left forewing, upper surface; 25, *Tetracnemus maculipennis* (De Santis) ♀, venation of left forewing, upper surface.

– Apex of clava obliquely truncate (Figs 50, 59, 63, 101, cf. Figs 58, 62). Hypopygium reaching or very nearly reaching apex of gaster (except in *Epiencyrtus* where clava is very distinctly obliquely truncate).
In some genera clava may appear apically rounded in dry mounted material depending on the way it has collapsed or the angle from which it is viewed, but in these genera the hypopygium very distinctly reaches apex of gaster 137

135 (134) Thorax orange with contrasting dark setae dorsally. Eyes with long hairs, each longer than diameter of facet. Gaster very short, at most as long as scutellum (care!; in material that has been in alcohol the gaster may have become distended) . . **APHYCOMORPHA** (p. 175)
– Thorax usually dark with contrasting pale setae, or, if orange then setae are pale. Eyes with numerous short inconspicuous hairs, each no longer than diameter of facet. Gaster much longer than scutellum 136

136 (135) Clava and segments three to six of funicle white contrasting with the brown scape, pedicel and first two funicle segments . . . . . **TYNDARICHOIDES** (p. 234)
– Clava dark or yellow, never white . . . . **METAPHYCUS** (p. 212)

137 (134) Hypopygium reaching just over half way along gaster. Forewing almost hyaline, very slightly and evenly infumate . . . . **EPIENCYRTUS** (p. 195)
– Hypopygium reaching apex of gaster. Infuscation of forewing generally strong, or, if weak then not evenly distributed 138

138 (137) Notaular lines at least anteriorly indicated. Infuscation of forewing limited to central spot below marginal vein with occasionally middle third of wing infuscate, base and apex hyaline. Clava usually distinctly shorter than funicle 139
– Notaular lines completely absent. Infuscation of forewing usually more extensive with either base or apex darkened. Clava often longer than funicle 141

139 (138) Notaular lines complete or meeting in middle (Fig. 1). Funicle segments and clava more or less subequal in width so that clava is not, or hardly, wider than first funicle segment (Fig. 50) . . . . **HOMALOTYLUS** (p. 203)
– Notaular lines incomplete and never meeting in middle, at most extending two-thirds across mesoscutum. Funicle segments distinctly broadening apically so that clava is at least one and a half times as wide as first funicle segment (Figs 58, 63) 140

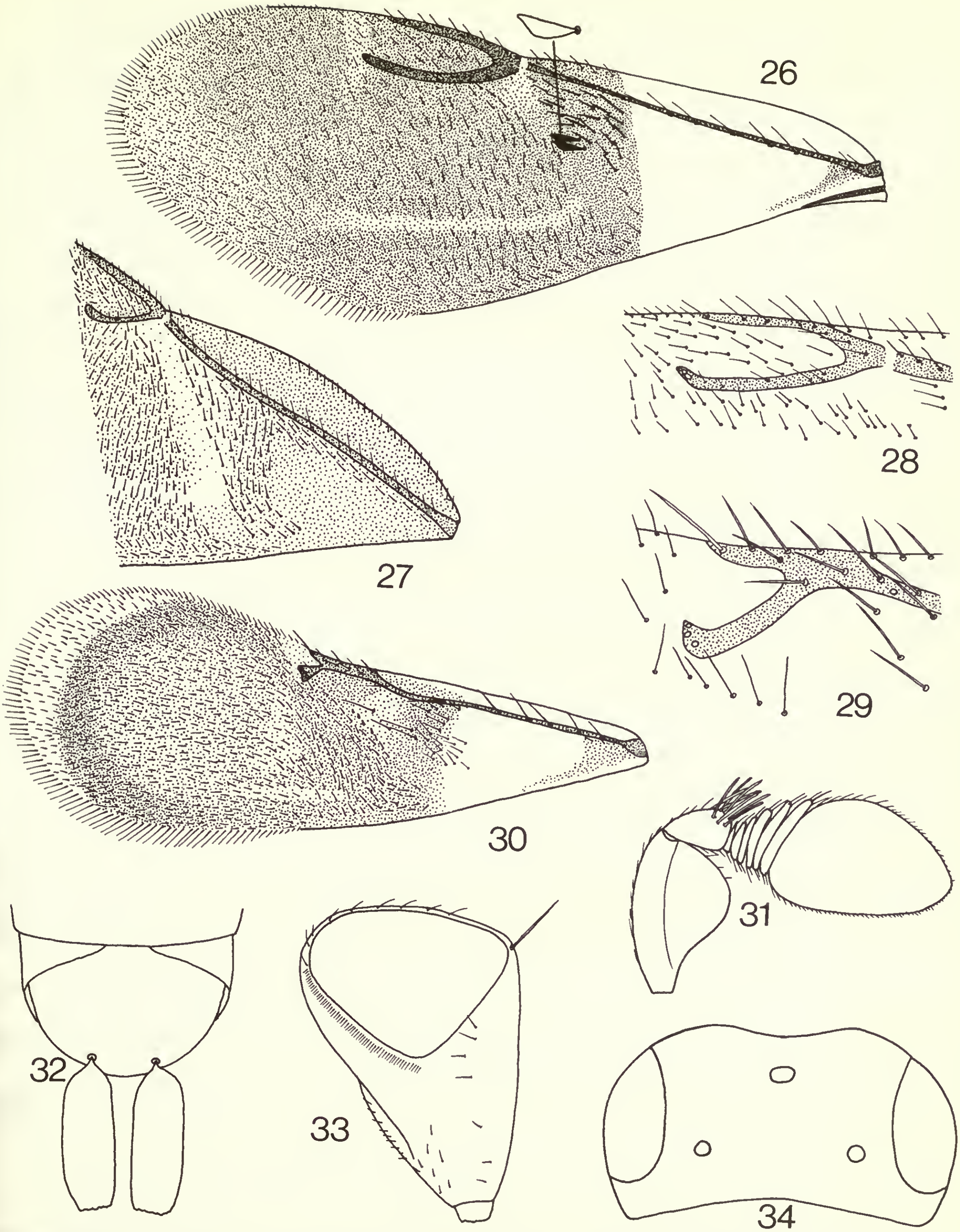
140 (139) First funicle segment very short, less than half as long as second (Fig. 63). Notaular lines anteriorly indicated only. Mid tibial spur very long and slightly longer than mid basitarsus. Mesoscutum and scutellum completely orange . **BRETHESIELLA** (p. 183)
– First funicle segment at least three-quarters as long as second (as in Fig. 58). Notaular lines reaching half way across mesoscutum. Mid tibial spur at most as long as basitarsus. Mesoscutum and scutellum usually with dark areas **ISODROMUS** (p. 206)

141 (138) Mesoscutum relatively short, at most slightly more than half as long as scutellum. Frontovertex at narrowest point about two-thirds of head width or more . . **CHALCASPIS** (p. 184)
– Mesoscutum longer, at least about two-thirds as long as scutellum. Frontovertex narrower, at narrowest point at most two-fifths head width 142

142 (141) Frontovertex narrower, at narrowest point at most one-sixth head width . . . **EURYRHOPALUS** (p. 196)
– Frontovertex broader, at narrowest point more than one-fifth head width 143

143 (142) Postmarginal vein distinctly longer, at least one and a half times as long as stigmal, forewing most strongly infumate towards apex . . . . . **BLEPYRUS** (p. 182)
– Postmarginal vein shorter, not longer than stigmal, forewing most strongly infumate towards base 144

144 (143) Clava as long or longer than funicle and usually much wider than funicle, antennae club-shaped (as in Fig. 62), all funicle segments transverse. Forewing: costal cell with two or three lines of setae dorsally . . . . **AENASIUS** (p. 170)



Figs 26–34 26, *Chrysoplatycerus splendens* (Howard) ♀, left forewing, upper surface; 27, *Zaplatycercus fullawayi* Timberlake ♀, base of left forewing, upper surface; 28, *Zarphopalus putophilus* Bennett ♀, venation of left forewing, upper surface; 29, *Hambletonia pseudococcina* Compere ♀, venation of left forewing, upper surface; 30, *Anicetus annulatus* Timberlake ♀, left forewing, upper surface; 31, *Hambletonia pseudococcina* Compere ♀, right antenna, outer aspect; 32, *Habrolepis dalmanni* (Westwood) ♀, scutellum in dorsal view, showing apical lamelliform setae; 33, *Anabrolepis zetterstedtii* (Westwood) ♀, head viewed from left side; 34, *Hunterellus hookeri* Howard ♀, head in dorsal view.

– Clava about half as long as funicle and not much wider than funicle, antenna not club-shaped, at least some funicle segments longer than broad or quadrate (Fig. 59). Forewing: costal cell dorsally with at most a few setae at its apex . . . . . ***HEMAENASIUS*** (p. 202)

145 (92) All funicle segments longer than broad 146
– Not all funicle segments longer than broad. 177

146 (145) Head more or less purplish brown with area below level of dorsal part of antennal scrobes shiny, metallic green with shallow shiny bottomed thimble-punctures. Frontovertex with five pale yellow areas: two circular ones about midway between anterior ocellus and antennal toruli on either side of frontovertex and touching eye margins, and three elongate spots on same level just above toruli and interantennal prominence all more or less joined to form a continuous transverse line (Fig. 67) . ***PLATYLYCA*** (p. 222)
– Head not as above 147

147 (146) Exserted part of ovipositor at least as long as one-quarter length of gaster. . . . 148
– Exserted part of ovipositor at most as long as one-fifth length of gaster 156

148 (147) Forewing narrow, more than three times as long as broad. Costal cell about as wide as diameter of submarginal vein (Fig. 70). Mandibles long, narrow and bidentate (as in Fig. 40) . . . . ***ANAGYRUS*** (p. 173)
– Forewing less than three times as long as broad, costal cell at least twice as broad as diameter of submarginal vein. Mandibles usually tridentate, or, if bidentate then relatively broad 149

149 (148) Postmarginal vein much longer than stigmal, speculum interrupted in lower half by two or three lines of setae on dorsal surface of wing (Fig. 68) 150
– Postmarginal vein not longer than stigmal, or, if slightly longer then speculum not interrupted 151

150 (149) Exserted part of ovipositor much longer than gaster and with sheaths cylindrical. Eyes with moderately long dark setae . . . . . . ***DELOENCYRTUS*** (p. 191)
– Exserted part of ovipositor shorter than gaster and with sheaths slightly flattened. Eyes more or less naked . . . . ***NEAPSILOPHRYS*** (p. 215)

151 (149) Ovipositor sheaths bilaterally flattened, together at least twice as deep (at deepest point of exserted part) as broad (at apex of gaster) 152
– Ovipositor sheaths cylindrical, or, if slightly flattened then together less than twice as deep (at deepest point of exserted part) as broad (at apex of gaster) 154

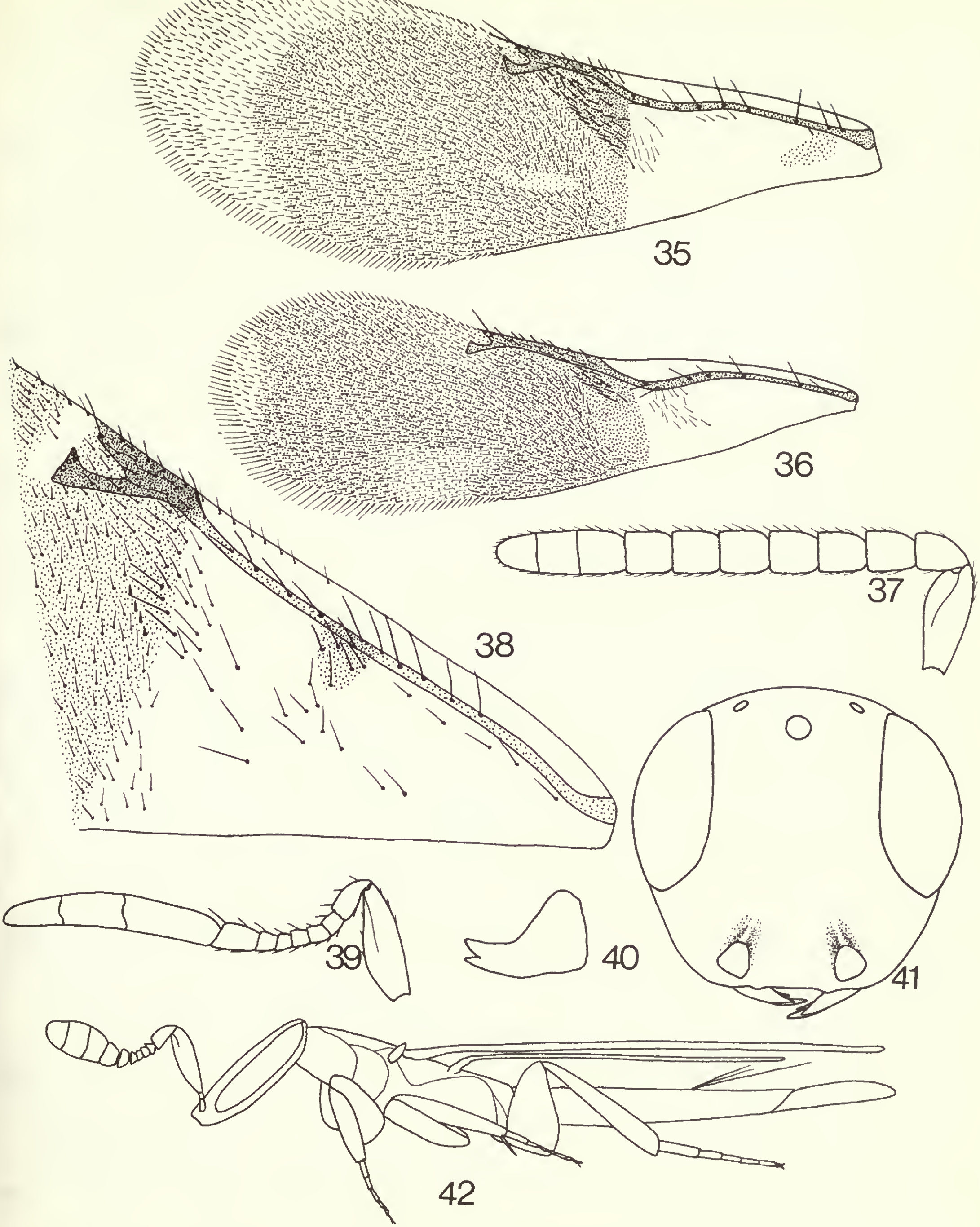
152 (151) Mandibles bidentate . . . . ***ASEIRBA*** (p. 179)
– Mandibles tridentate 153

153 (152) Hypopygium reaching apex of gaster. Scutellum flat with an apical translucent flange (Fig. 60) or very convex. Occipital margin sharp . . . ***HEMENCYRTUS*** (p. 202)
– Hypopygium extending about half way along gaster. Scutellum quite flat but without apical translucent flange. Occipital margin not sharp. . . . ***CERCHYSIUS*** (p. 184)

154 (151) Occipital margin not sharp. Hypopygium reaching about half way along gaster . . ***CERCHYSIUS*** (p. 184)
– Occipital margin sharp. Hypopygium longer, reaching more or less to apex of gaster. 155

155 (154) Marginal vein punctiform (Fig. 69). Sculpture of scutellum often deep but never in distinct whorls. Setae on mesoscutum dark. Axillae usually hardly raised above level of scutellum and with posterior margin distinctly sculptured, very rarely as below . ***COPIDOSOMA*** (p. 189)

– Marginal vein at least about twice as long as broad (Fig. 65). Sculpture of scutellum usually longitudinally striate-reticulate, more or less forming distinct whorls. Mesoscutum usually with conspicuous white setae. Axillae step-like and distinctly raised above level of scutellum with posterior margin almost vertical and very polished . . . . ***APSILOPHRYS*** (p. 176)



Figs 35–42 35, *Prochiloneurus dactylopii* (Howard) ♀, left forewing, upper surface; 36, *Cheiloneurus* sp. ♀, left forewing, upper surface; 37, *Gahaniella tertia* Kerrich ♀, left antenna, outer aspect; 38, *Iceromyia flavifrons* sp. n. ♀, base of left forewing, upper surface; 39, *Coccidencyrtus* sp. ♀, left antenna, outer aspect; 40, *Anagyrus insolitus* (Howard) ♀, left mandible; 41, *Shenahetia masneri* sp. n. ♀, head in frontal aspect; 42, *Mariola flava* sp. n. ♀, whole insect viewed from left side.

156 (147) Forewing: speculum interrupted by 2 or 3 lines of setae in lower half, or completely closed at this point by at least 6 or 7 lines of setae, basal cell completely pilose dorsally with setae as dense or nearly as dense as in centre of wing (as in Figs 70, 71) . . . 157

– Forewing: speculum not interrupted or interrupted only by one line of setae, or sometimes closed near hind margin of wing by two or three lines of setae, or, if speculum interrupted then at least proximal one-third of basal cell naked dorsally and setae are noticeably less dense than in centre of wing . . . 160

157 (156) Postmarginal vein distinctly longer than stigmal, dorsum of thorax usually orange (rarely black) with conspicuous dark setae on mesoscutum. Pedicel and flagellum often concolorous, black . . . ***LEPTOMASTIX*** (p. 206)

– Postmarginal vein not longer than stigmal (Figs 70, 71). Dorsum of thorax dark or occasionally orange, but always with pale setae on mesoscutum. Pedicel and flagellum not unicolorous, at least apex of pedicel white, or clava yellowish . . . 158

158 (157) Postmarginal vein very short or absent (as in Figs 70, 71). Sculpture of scutellum more or less same as that on mesoscutum . . . ***ANAGYRUS*** (p. 173)

– Postmarginal vein as long, or nearly as long, as stigmal. Sculpture of scutellum deeper and coarser than that on mesoscutum . . . 159

159 (158) Scape distinctly broadest at middle. Scutellum with deep, dense punctiform sculpture. Head in side view with posterior margin of eye adjacent to occipital margin for over half its length. Funicle and whole of pedicel black, clava white . ***ANATHRIX*** (p. 174)

– Scape broadest just above middle or parallel-sided. Scutellum with slightly elongate sculpture. Head in side view with posterior margin of eye diverging from occipital margin at much less than half its length. At least one funicle segment or apex of pedicel paler than rest of flagellum . . . ***APOANAGYRUS*** (p. 176)

160 (156) Apex of scutellum with a tuft of longer setae, or, if tuft indistinct then at least posterior third of mesoscutum clothed in dense white setae which contrast strongly with dark colour of mesoscutum. Scutellum with deep sculpture and not shiny. Submarginal vein usually slightly expanded in apical third . . . ***ZAOMMA*** (p. 235)

– Apex of scutellum without tuft of setae, at most with a few upright setae. Mesoscutum not with contrasting pale setae, or, if with some pale setae then posterior third of scutellum shiny. Submarginal vein usually not expanded in apical third . . . 161

161 (160) Apical third of submarginal vein with triangular expansion (Fig. 57) (sometimes indistinct but usually indicated by a single long seta) . . . ***PARECHTHRODRYINUS*** (p. 221)

– Submarginal vein without triangular expansion . . . 162

162 (161) Scutellum very convex and with numerous distinct short ridges running backwards from axillae (Fig. 74) . . . ***LIRENCYRTUS*** (p. 207)

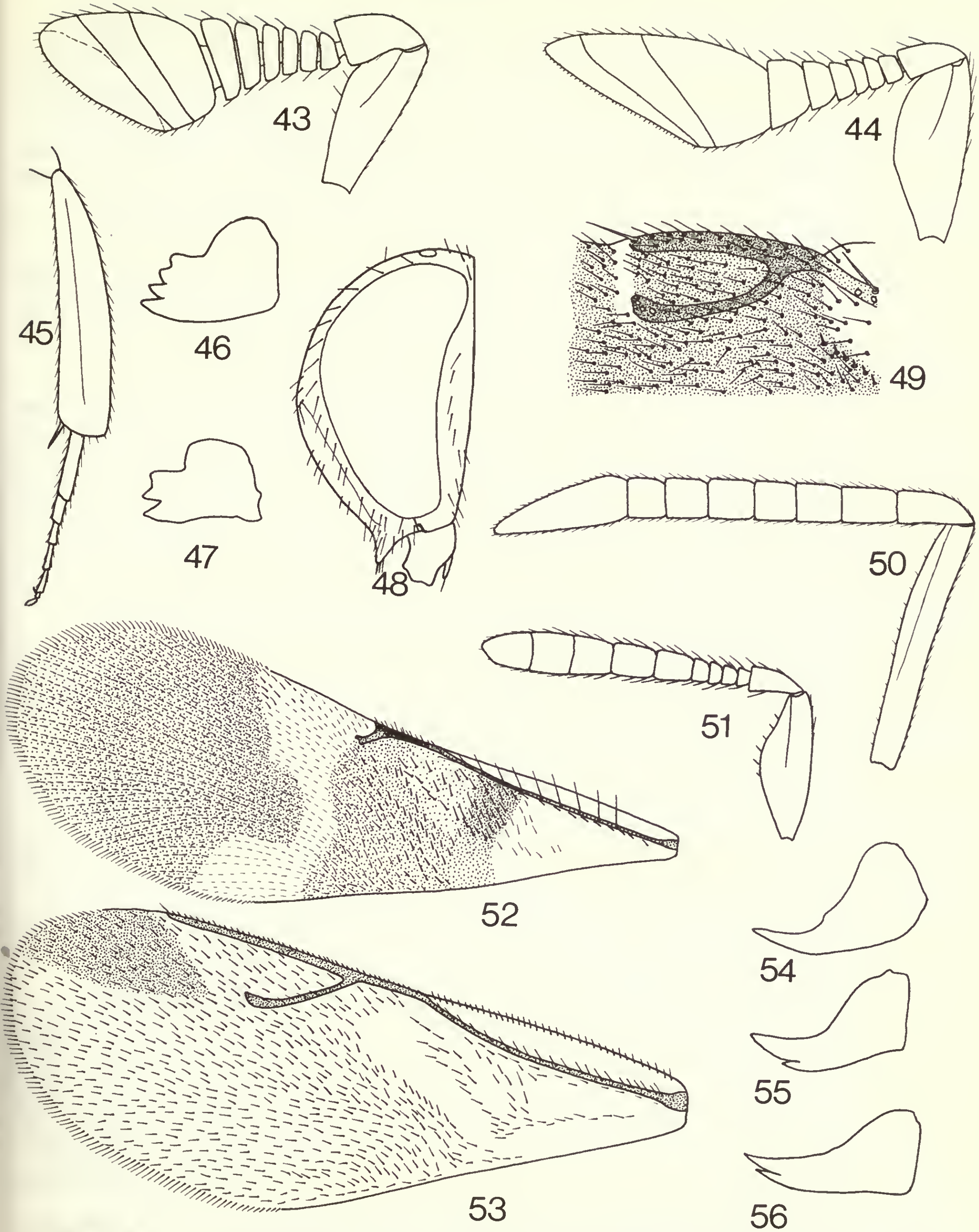
– Scutellum without numerous short ridges at base . . . 163

163 (162) Eyes distinctly hairy, occasionally hairs pale and inconspicuous but always as long as the diameter of facet. Propodeum medially at least one-fifth as long as scutellum and usually with sculpture centrally which contrasts with the smoother lateral areas (Fig. 60, cf. Fig. 121). Marginal vein at least about three times as long as broad; occipital margin sharp . . . 164

– Eyes not hairy, or, if slightly hairy the following characters are all present: hairs on eyes pale and inconspicuous and not longer than a facet, *and* occipital margin not sharp, *and* marginal vein less than twice as long as broad. Propodeum medially usually less than one-sixth as long as scutellum and without sculpture centrally (except in *Helegonatopus* and *Mucrencyrtus* where the eyes are completely naked) . . . 165

164 (163) Ovipositor usually visible with sheaths bilaterally flattened. Mandibles broad and tridentate, lower teeth subequal in length, upper tooth often short and indistinct. Scutellum either flat with distinct translucent apical flange (Fig. 60) or very convex with flange indistinct or absent. Hypopygium reaching apex of gaster . . . ***HEMENCYRTUS*** (p. 202)

– Ovipositor usually hidden, but if visible then sheaths are cylindrical. Mandibles unidentate (Fig. 54) or bidentate with upper tooth long and curved (Figs 55, 56),



Figs 43–56 43, *Bennettisca flavigena* sp. n. ♀, left antenna, outer aspect; 44, *Iceromyia flavifrons* sp. n. ♀, left antenna, outer aspect; 45, *Moorella fulviceps* Cameron ♀, left hind tibia and tarsus, outer aspect; 46, *Adelencyrtus moderatus* (Howard) ♀, left mandible; 47, *Coccidencyrtus* sp. ♀, left mandible; 48, *Parablastothrix* sp. ♀, head viewed from left side; 49, *Encyrtus lecaniorum* (Mayr) ♀, left forewing venation, upper surface; 50, *Homalotylus terminalis* (Say) ♀, left antenna, outer aspect; 51, *Hemaenasius* sp. ♀, left antenna, outer aspect; 52, *Neococcidencyrtus* sp. ♀, left forewing, upper surface; 53, *Ericydnus lamasi* (Domenichini) ♀, left forewing, upper surface; 54–56, *Rhytidothorax* spp., left mandibles.

distinctly longer than lower tooth. Scutellum always fairly flat and without apical translucent flange (although occasionally a flange is present, but distinctly sculptured and not translucent). Hypopygium not reaching apex of gaster, often quite long laterally and nearly reaching apex, but deeply incised medially . . . . . **RHYTIDOTHORAX** (p. 226)

165 (163) Flagellum bicolorous: funicle brown, clava white or yellow. Mandibles with two teeth and a truncation . . . . **LOHIELLA** (p. 209)

– Flagellum unicolorous, or if as above, then mandibles are bidentate 166

166 (165) Scape relatively short, not longer than malar space. Antennal toruli high on head, more than twice the length of each torulus from mouth margin. All funicle sements about as long and as wide as pedicel (as in Fig. 37).
Mandibles without teeth or with one tooth and a truncation **GAHANIELLA** (p. 197)

– Scape distinctly longer than malar space or antennal torulus less than twice its own length from mouth margin. First funicle segment distinctly shorter than pedicel, at most three-quarters as long and distinctly less in diameter 167

167 (166) Clava at least three-quarters as long as funicle. Legs completely yellowish white. . [***Coccidencyrtus malloi*** Blanchard] (p. 188)

– Clava at most two-thirds as long as funicle. Legs orange or at least partially darkened 168

168 (167) Mandibles with one or two teeth and a truncation (Figs 72, 73). Hypopygium at most reaching just over half way along gaster. Clava apically round or with a short oblique truncation 169

– Mandibles with three acute teeth (Fig. 97), or, if third (upper) tooth developed but truncate, then hypopygium reaches or nearly reaches apex of gaster and apex of clava is transversely truncate 172

169 (168) Either marginal vein more r less punctiform (at most about one and a half times as long as broad) or postmarginal absent or nearly absent (Figs 75, 76, 81). Mesoscutum often bright metallic green 170

– Marginal vein at least twice as long as broad, postmarginal distinct, usually as long or nearly as long as radial (Fig. 79). Mesoscutum rarely green 172

170 (169) Head lenticular, in side view more than twice as long as deep (Fig. 82) and in dorsal view over two and a half times as wide as deep (Fig. 83). Antennal scrobes very shallow and indistinct . . . . **SIMMONDSIELLA** (p. 229)

– Head of more normal proportions, in side view less than twice as long as deep and in dorsal view less than twice as wide as deep. Antennal scrobes moderately to deeply impressed 171

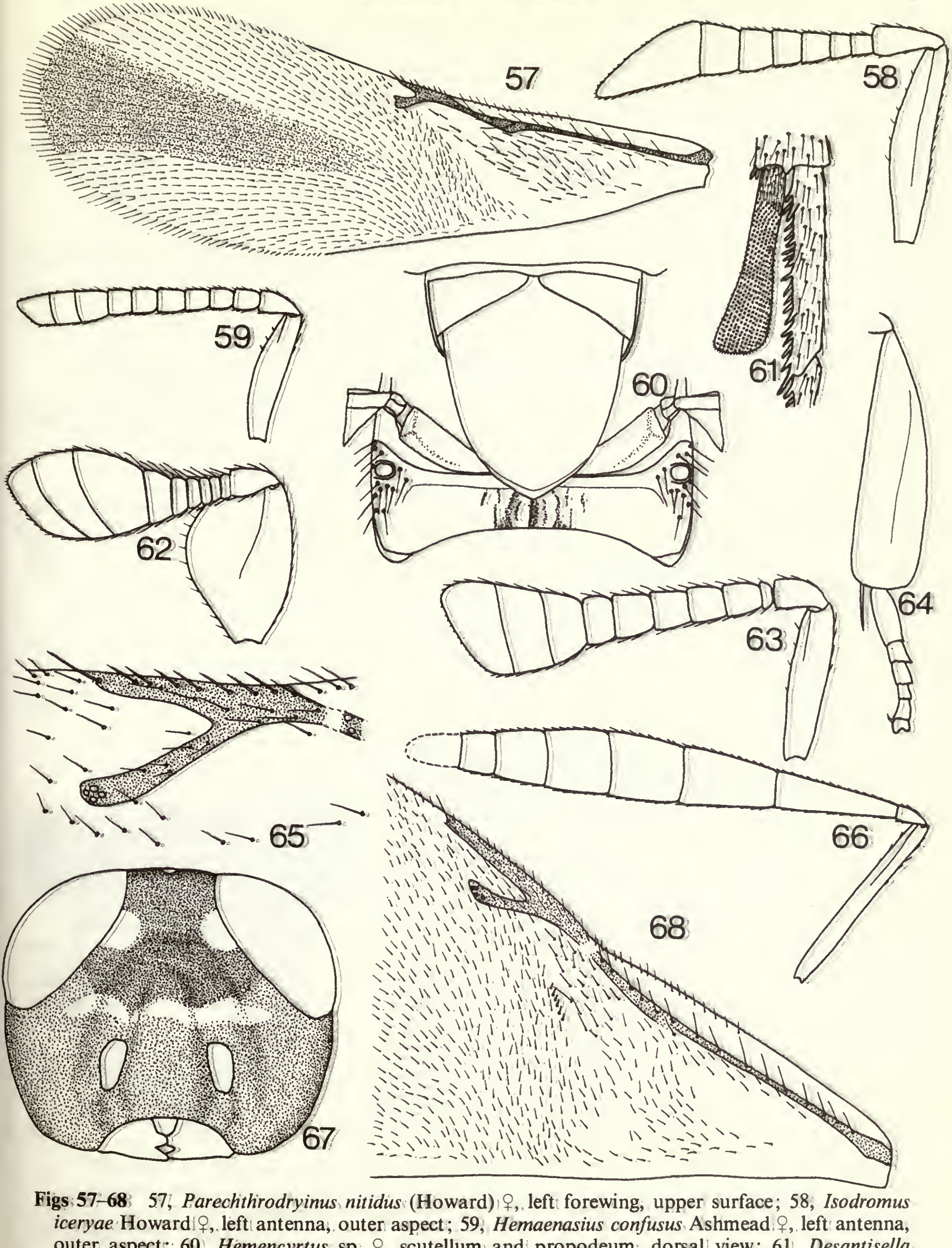
171 (170) Posterior margin of mesoscutum gently curved or with either side straight and centrally slightly angled so that axillae appear to meet centrally and not greatly separated by posterior margin of mesoscutum (Fig. 78). Setae on antenna very short, the longest less than half the diameter of the first funicle segment. Stigmal vein distinctly longer than marginal, postmarginal distinct and only slightly shorter than marginal (Fig. 75). Frontovertex at narrowest point usually at least one-third head width. Parasites of psyllid nymphs. . . . . **PSYLLAEPHAGUS** (p. 226)

– Posterior margin of mesoscutum produced backwards in middle third so that axillae appear to be widely separated (Fig. 77). Setae of antennae longer, the longest about as long or longer than the diameter of the first funicle segment. Stigmal vein rarely longer than marginal, postmarginal usually not distinct or at most not as long as marginal (Fig. 76). Frontovertex generally less than one-fifth head width, rarely a great deal wider. . . . . **OOENCYRTUS** (p. 217)

172 (168, 169) Marginal vein punctiform and at most half as long as stigmal (Figs 85, 90, 109, also as in 69). Hypopygium extending to at least five-sixths along gaster 173

– Marginal vein distinctly longer than broad, at least slightly more than half as long as stigmal (Fig. 79). Hypopygium extending to at most three-quarters along gaster . 175

173 (172) Hypopygium with apex rounded, not produced as narrow projecting tongue. Head and thorax metallic . . . . **COPIDOSOMA** (p. 189)



Figs 57–68 57, *Parechthrodryinus nitidus* (Howard) ♀, left forewing, upper surface; 58, *Isodromus iceryae* Howard ♀, left antenna, outer aspect; 59, *Hemaenasius confusus* Ashmead ♀, left antenna, outer aspect; 60, *Hemencyrtus* sp. ♀, scutellum and propodeum, dorsal view; 61, *Desantisella trifasciata* De Santis ♀, mid tibial spur; 62, *Aenasius phenacocci* Bennett ♀, left antenna, outer aspect; 63, *Brethesiella* sp. ♀, left antenna, outer aspect; 64, *Carabunia myersi* Waterston ♀, left hind tibia and tarsus, outer aspect; 65, *Apsilophrys* sp. ♀, left forewing venation, upper surface; 66, *Anusioptera aureocincta* Brues ♀, left antenna, outer aspect (clava missing); 67, *Platylyca quadraticeps* De Santis ♀, head in frontal aspect; 68, *Neapsilophrys flavipes* sp. n. ♀, left forewing base, upper surface.

– Hypopygium apically produced into narrow projecting tongue which may be almost as long as half length of gaster (Fig. 84). Head and thorax orange 174

174 (173) Forewing: setae on dorsal surface of costal cell limited to line from about half way along to apex of cell near wing margin, basal cell distinctly less pilose than centre of wing (Fig. 85). Antennal scrobes not deep or well defined and with interantennal prominence dorsally more or less rounded ***PARAMUCRONA*** (p. 219)

– Forewing: setae on dorsal surface of costal cell rather dense, particularly in distal half, not limited to a single line near wing margin, basal cell about as densely pilose as centre of wing (Fig. 90). Antennal scrobes quite deep and well defined and with interantennal prominence dorsally produced as a long, very acute ridge (Fig. 80) ***MUCRENCYRTUS*** (p. 213)

175 (172) Scutellum longitudinally striate with silky lustre ***MERCETENCYRTUS*** (p. 211)

– Scutellum not longitudinally striate and without silky lustre 176

176 (175) Basal two-thirds or three-quarters of scutellum with raised very rough sculpture which contrasts very strongly with the highly polished apex. Centre of propodeum with distinct sculpture. Venation of forewing yellowish or testaceous. Apex of clava rounded ***HELEGONATOPUS*** (p. 200)

– Scutellum more or less evenly sculptured, never with sculpture at base contrasting so strongly with that at apex. Centre of propodeum smooth. Venation of forewing usually dark brown. Clava apically with at least a short oblique truncation ***SYRPHOPHAGUS*** (p. 230)

177 (145) First funicle segment longer than broad 178

– First funicle segment not longer than broad 207

178 (177) Exserted part of ovipositor with sheaths distinctly flattened, together more than twice as deep as broad at apex of gaster. Mesoscutum not with distinct thimble-punctured sculpture and scutellum never smooth and shiny 179

– Ovipositor not exserted, or, if exserted then sheaths more or less cylindrical, or, if slightly flattened (*Zeteticontus*) then mesoscutum has deep thimble-punctured sculpture or scutellum is smooth and shiny 181

179 (178) Eyes relatively small, frontovertex at narrowest point about half head width, malar space about two-thirds length of eye. Posterior ocellus separated from eye margin by at least its own diameter. Postmarginal vein very short, about one-third length of marginal which is shorter than stigmal. Exserted part of ovipositor longer than gaster. Mandible with two strong teeth ***GONZALEZIA*** (p. 197)

– Eyes larger, frontovertex at narrowest less than half head width, malar space at most one-third as long as an eye. Posterior ocellus separated from eye margin by less than its own diameter. Postmarginal vein nearly as long or longer than stigmal. Exserted part of ovipositor much shorter than gaster, often only just visible. Mandible with at least a very short third (upper) tooth 180

180 (179) Hypopygium reaching apex of gaster ***HEMENCYRTUS*** (p. 202)

– Hypopygium reaching to about half way along gaster. ***Encyrtus conformis*** Howard (p. 195)

181 (179) Frontovertex or mesoscutum with conspicuous deep thimble-punctures usually separated by at most their own diameters 182

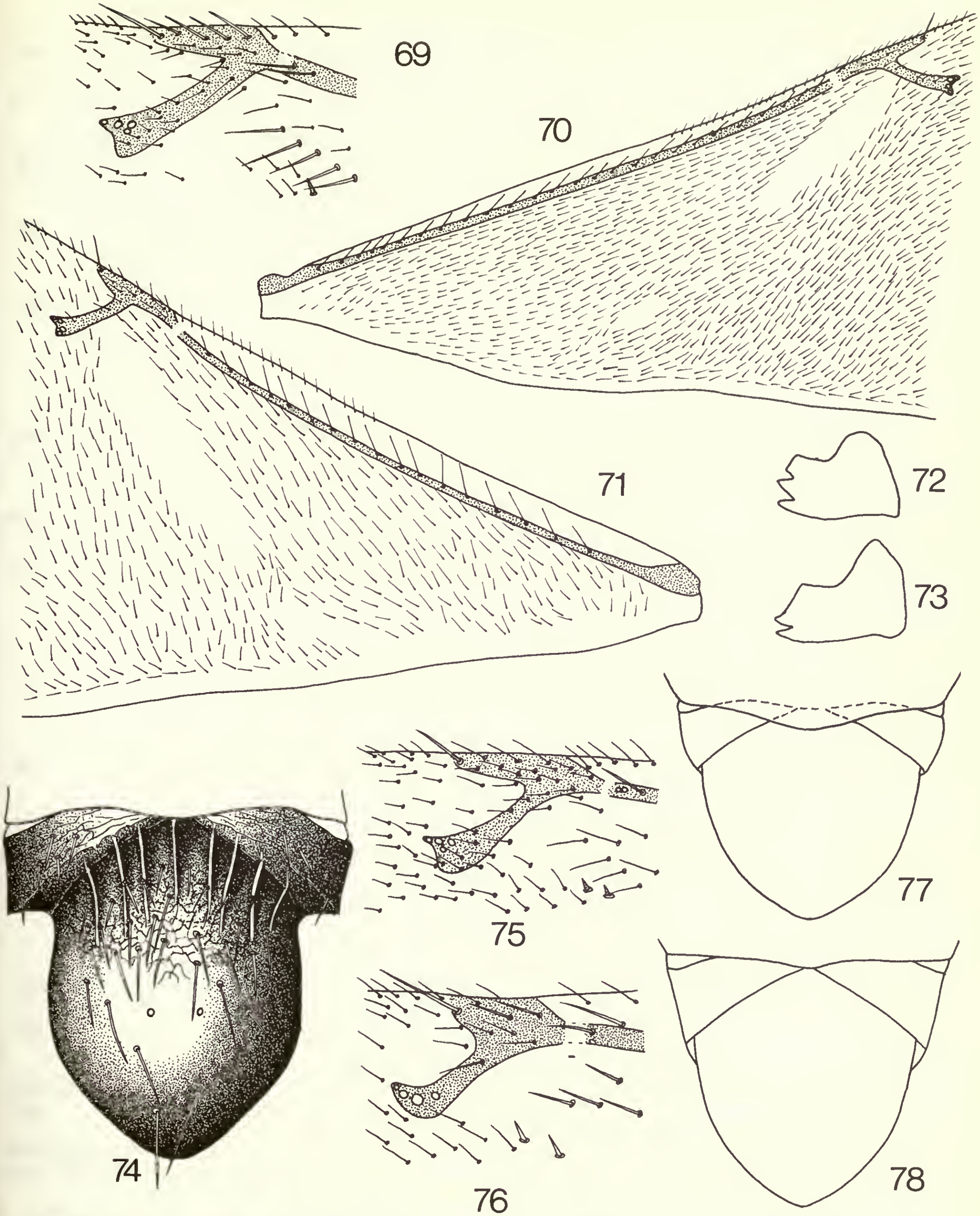
– Sculpture not as above, generally reticulate and shallow, occasionally with distinct piliferous punctures but these are small and separated by much more than their own diameters 186

182 (181) Scutellum very smooth and shiny, devoid of sculpture except occasionally in basal half, at least apical third very polished (occasionally basal two-thirds has thimble-punctured sculpture, but spaces between punctures are polished) ***ZETETICONTUS*** (p. 236)

– All of scutellum distinctly sculptured 183

183 (182) Marginal vein punctiform or absent (Figs 86, 87) 184

– Marginal vein at least twice as long as broad 185



Figs 69–78 69, *Copidosoma virescens* De Santis ♀, left forewing venation, upper surface; 70, *Anagyrus bellator* (De Santis) ♀, right forewing base, upper surface; 71, *Anagyrus* sp. ♀, left forewing base, upper surface; 72, *Psyllaephagus trellesi* (Blanchard) ♀, left mandible; 73, *Psyllaephagus rotundiformis* (Howard) ♀, left mandible; 74, *Lirencyrtus primus* sp. n. ♀, scutellum, dorsal aspect; 75, *Psyllaephagus rotundiformis* (Howard) ♀, left forewing venation, upper surface; 76, 77, *Ooencyrtus trinidadensis* Crawford ♀, (76) left forewing venation, upper aspect, (77) scutellum, dorsal aspect; 78, *Psyllaephagus rotundiformis* (Howard) ♀, scutellum, dorsal aspect.

184 (183) Marginal vein more or less absent, stigmal vein usually arising before submarginal reaches wing margin (Fig. 86). Frontovertex with shiny bottomed piliferous punctures. Mandibles with two teeth and a truncation ***LOCHITOENCYRTUS*** (p. 209)

– Marginal vein present, punctiform (as in Fig. 87). Piliferous punctures on frontovertex not shiny bottomed. Mandibles with three acute teeth . ***BOTHRIOTHORAX*** (p. 182)

185 (183)* Clava apically rounded. Punctures on frontovertex not shiny bottomed. Mandibles with three acute teeth . . . . ***HEMENCYRTUS*** (p. 202)

– Clava obliquely truncate (Fig. 88). Punctures on frontovertex shiny bottomed. Mandibles with two teeth and a truncation or with a rudimentary third (upper) tooth ***HELMECEPHALA*** (p. 200)

186 (181) Hypopygium clearly extending past apex of epipygium (Fig. 89). Postmarginal vein longer than stigmal. Exserted part of ovipositor at least half as long as gaster . ***COCCIDOCTONUS*** (p. 188)

– Hypopygium clearly not extending past apex of epipygium. Postmarginal vein not longer than stigmal, or, if so then ovipositor is more or less hidden or only slightly exserted 187

187 (186) All funicle segments longer than broad, except the second which is anelliform (Fig. 92) ***CYDERIUS*** (p. 190)

– Funicle not as above 188

188 (187) Propodeum medially at least one-sixth as long as scutellum and with some sculpture centrally (Fig. 60) 189

– Propodeum medially at most one-seventh as long as scutellum and more or less smooth centrally 194

189 (188) Eyes and frontovertex with long conspicuous setae. Hypopygium reaching apex of gaster. Mandibles tridentate. Apex of scutellum with translucent flange (Fig. 60) (occasionally if scutellum is very convex flange may be indistinct or absent). Body dark and shiny . . . . ***HEMENCYRTUS*** (p. 202)

– Eyes and frontovertex without conspicuous long setae, or, if present then mandibles unidentate or bidentate and hypopygium does not reach apex of gaster. Apex of scutellum never with a translucent flange, or, if flange present then body completely orange and not shiny 190

190 (189) Scutellum very convex with very deep, rough, elongate sculpture, apex with a small, thin, more or less triangular, foliate extension (Fig. 94). Clava obliquely truncate (Fig. 106) . . . . ***AMAURILYMA*** (p. 171)

– Scutellum rather flat, occasionally with deep elongate sculpture, but never rough and without apical extension. Clava apically rounded or transversely truncate . . 191

191 (190) Mandibles unidentate (Fig. 52) or bidentate (Figs 55, 56). Eyes with conspicuous long hairs. Apical margin of scutellum usually with an inconspicuous carina (as in Fig. 121) . . . . ***RHYTIDOTHORAX*** (p. 226)

– Mandibles tridentate. Eyes without conspicuous hairs, at most with a few short pale ones. Apical margin of scutellum without carina, often quite smooth . . . 192

192 (191) Head and thorax mostly metallic green or greenish blue. Gaster longer than thorax . ***PARECHTHRODRYINUS*** (p. 221)

– Head or thorax largely orange. Gaster shorter than thorax. 193

193 (192) Head black. Clava apically truncate (Fig. 200) . . ***PROTYNDARICHOIDES*** (p. 224)

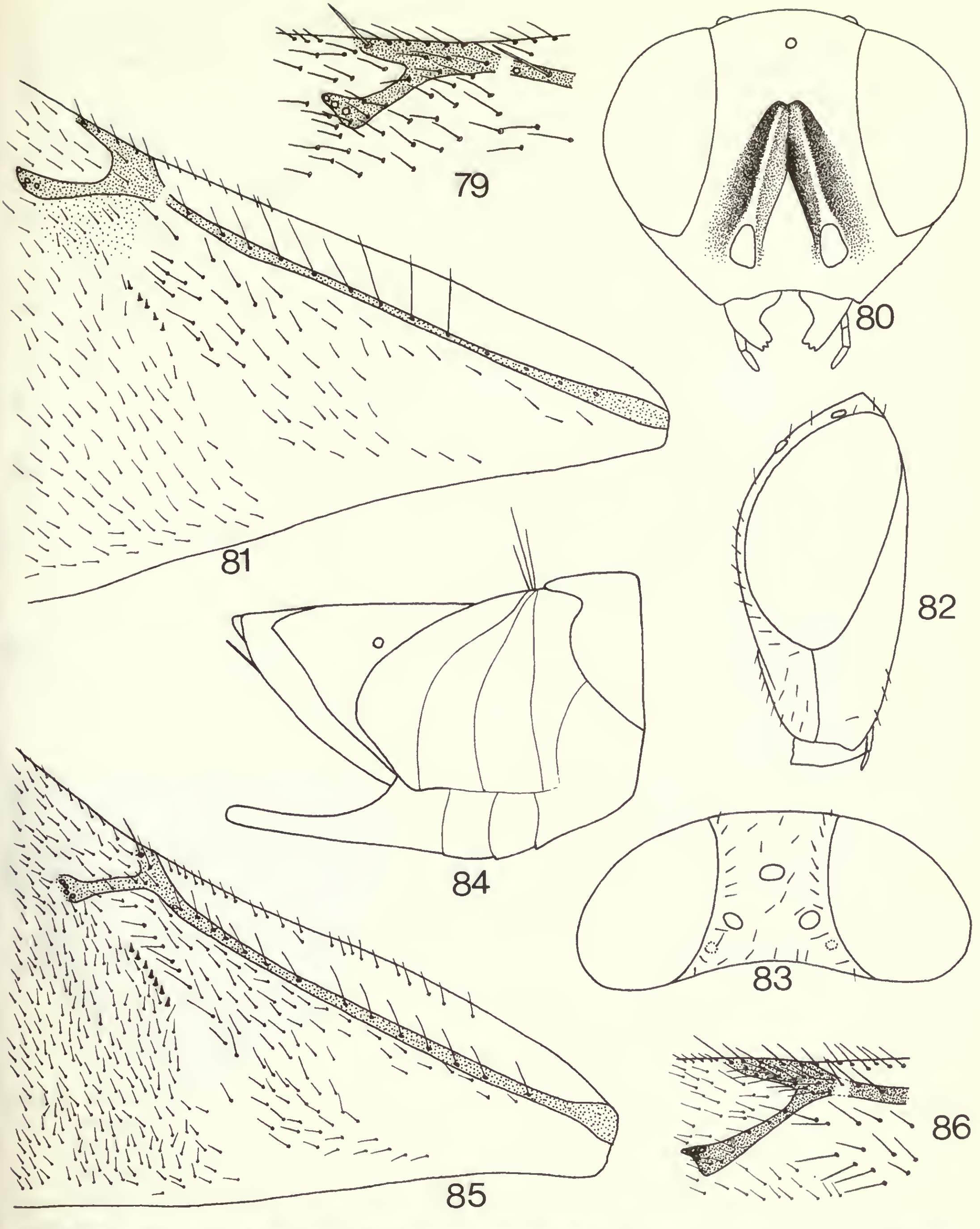
– Head orange. Clava apically rounded (Fig. 189) . . . ***MUCRENCYRTUS*** (p. 213)

194 (188) Thorax and head mostly orange and yellow, never metallic. . . . . . . ***Metaphycus ceroplastae*** (Dozier) (p. 212)

– At least thorax, excluding legs, dark brown or green and metallic or shiny. . . . 195

---

* Note added while this paper was in press. *Tachinaephagus* Ashmead may run here, but differs from *Hemencyrtus* in having a smooth convex scutellum with the apical flange very small, almost absent, and the eyes separated from the occipital margin by about half the diameter of an ocellus (very nearly reaching the occipital margin in *Hemencyrtus*).



Figs 79–86 79, *Syrphophagus* sp. ♀, left forewing venation, upper surface; 80, *Mucrencyrtus insulanus* sp. n. ♀, head in frontal aspect; 81–83, *Simmondsiella flaviptera* sp. n., ♀, (81) left forewing base, upper surface, (82) head viewed from left side, (83) head, dorsal view; 84, *Mucrencyrtus insulanus* sp. n. ♀, gaster viewed from right side; 85, *Paramucrona brasiliensis*sp. n. ♀, left forewing base, upper dorsal view; 90, *Mucrencyrtus insulanus* sp. n. ♂, left forewing base, upper surface; 91,

195 (194) Head not unicolorous, mostly dark brown with white or pale yellow areas on lower part of face, particularly around antennal scrobes and on interantennal prominence (Fig. 93) . . . . . ***TACHARDIOBIUS*** (p. 231)
– Head unicolorous without yellow or white markings 196

196 (195) Scape short, not longer than malar space, all funicle segments and pedicel subquadrate and subequal in length and breadth, not distinctly widening towards apex of antenna, clava about as wide as first funicle of segment (as in Fig. 37)
Mandibles without teeth or with one tooth and a broad truncation . . . ***GAHANIELLA*** (p. 197)
– Scape longer, longer than malar space, funicle segments and pedicel not subequal in length and breadth, with either the first funicle segment distinctly shorter than pedicel, or funicle segments broadening distinctly so that clava is wider than first funicle segment 197

197 (196) Mandibles with one or two teeth and a truncation (Figs 72, 73, 91). Clava apically rounded or obliquely truncate. Hypopygium, at most, reaching only just over half way along gaster 198
– Mandibles with three acute teeth (Fig. 97), or, if the upper tooth is truncate then hypopygium more or less reaches apex of gaster and apex of clava is transversely truncate 200

198 (197) Posterior margin of mesoscutum gently curved or with either side straight and centrally slightly angled so that axillae appear to meet centrally or are not greatly separated by posterior margin of mesoscutum (Fig. 78). Marginal vein punctiform, postmarginal at least half as long as stigmal (Fig. 75). Antenna with short setae, the longest less than half as long as the diameter of the first funicle segment. Mesoscutum bright metallic green or blue-green.
Parasites of psyllid nymphs . . . . . ***PSYLLAEPHAGUS*** (p. 226)
– Posterior margin of mesoscutum usually produced backwards in middle third so that axillae appear to be widely separated (as in Fig. 77). Marginal vein longer than broad, or, if punctiform then stigmal vein is very short and rarely longer than marginal and postmarginal usually indistinct. Antenna with longer setae, the longest about as long, or longer than diameter of first funicle segment. Mesoscutum usually not bright metallic green or blue-green 199

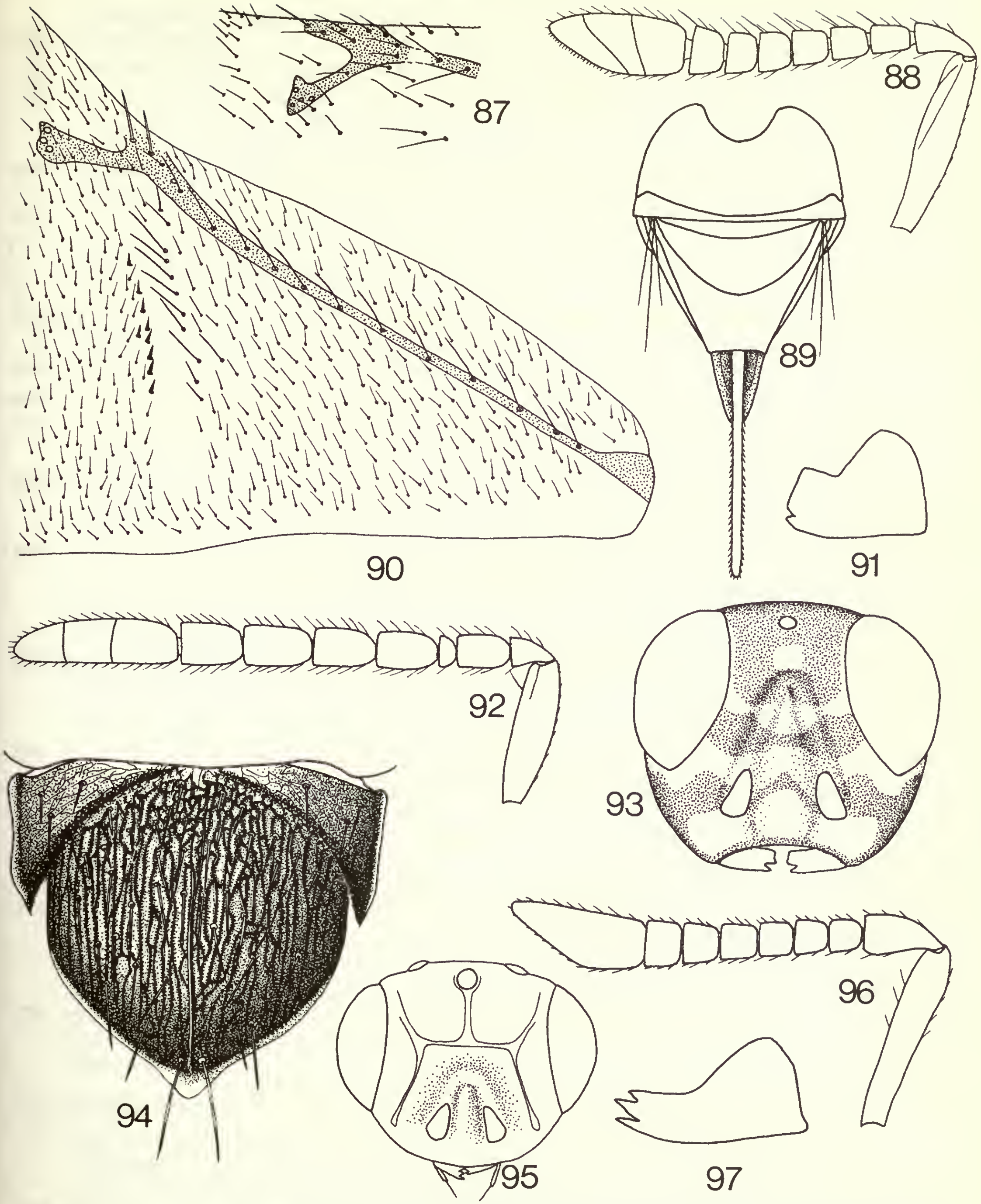
199 (198) Stigmal vein very short, not longer than the very short more or less punctiform marginal, post-marginal indistinct or absent (as in Fig. 76) . ***OOENCYRTUS*** (p. 217)
– Marginal vein always longer than broad, stigmal relatively long, postmarginal distinct and nearly as long as stigmal 200

200 (197, 199) Clava entire and obliquely truncate (as in Fig. 96) . . . ***LITOMASTIX*** (p. 208)
– Either clava three-segmented or apically rounded 201

201 (200) Hypopygium reaching to at least five-sixths along gaster. Antennal torulus very close to mouth margin, separated by less than half its length. Funicle segments more or less subequal in width. Marginal vein punctiform, postmarginal vein sometimes very short or almost absent. Mandibles always with three acute teeth or rarely with upper tooth blunt or truncate . . . . . ***COPIDOSOMA*** (p. 189)
– Hypopygium reaching to at most two-thirds along gaster. Antennal torulus separated from mouth margin by more than half its length. Funicle segments distinctly widening towards apex of antenna. Marginal vein longer than broad, postmarginal vein always at least half as long as stigmal. Mandibles usually not with three acute teeth 202

202 (201) Exserted part of ovipositor at least as long as one-third length of gaster. Scutellum dorsally very flat with deep punctate to slightly elongate sculpture ***GRISSELLIA*** (p. 197)
– Ovipositor not, or hardly, protruding. Either scutellum convex, occasionally with punctate sculpture, or flat and quite smooth 203

203 (202) Scutellum longitudinally striate with silky lustre . . . ***MERCETENCYRTUS*** (p. 211)
– Scutellum not longitudinally striate and without silky lustre 204



Figs 87–97 87, *Bothriothorax* sp. ♀, left forewing venation, upper surface; 88, *Helmecephala albisetosa* sp. n. ♀, left antenna, outer aspect; 89, *Coccidoctonus trinidadensis* Crawford ♀, gaster in dorsal view; 90, *Mucrencyrtus insulanus* sp. n. ♂, left forewing base, upper surface; 91, *Echthrodryinus* sp. ♀, left mandible, ♀; 92, *Cyderius urbicola* sp. n., left antenna, outer aspect; 93, *Tachardiobius nigricans* De Santis ♀, head in frontal aspect (reconstructed from collapsed head of holotype); 94, *Amaurilyma* sp. ♀, scutellum in dorsal view; 95, *Szelenyiola* sp. ♀, head in frontal aspect; 96, *Litomastix truncatella* (Dalman) ♀, left antenna, outer aspect; 97, *Copidosoma koehleri* Blanchard ♀, left mandible.

204 (203) Eyes and frontovertex with conspicuous long dark setae. Scutellum moderately flat, quite smooth and shiny . . . . ***EXORISTOBIA*** (p. 196)

– Eyes and frontovertex without conspicuous long dark setae. Scutellum very convex and with distinct sculpture 205

205 (204) Scutellum (without axillae) relatively long and narrow, a little longer than broad at base and not evenly rounded. Forewing venation usually dark brown . . . . ***SYRPHOPHAGUS*** (p. 230)

– Scutellum (without axillae) relatively broader, little wider than long and rather evenly rounded. Forewing venation usually yellowish or testaceous 206

206 (205) Apex of scutellum very shiny, contrasting with anterior two-thirds or three-quarters which has distinct (sometimes deep) sculpture. Marginal vein not more than twice as long as broad. Head, in side view, less than twice as long as deep . . . . . ***ECHTHRODRYINUS*** (p. 193)

– Apex of scutellum with distinct sculpture. Marginal vein at least twice as long as broad. Head, in side view, at least twice as long as deep . . ***TRICHOMASTHUS*** (p. 234)

207 (177) Dorsum of thorax, including axillae, orange or yellow 208

– At least axillae or mesoscutum dark 212

208 (207) Body dorso-ventrally flattened. Mesoscutum entire. Mandibles bidentate with teeth of equal length . . . . ***RHOPUS*** (p. 226)

– Body not flattened. Mandibles not bidentate, or, if bidentate then either upper tooth is much longer than lower (*Rhytidothorax*) or mesoscutum has notaular lines anteriorly indicated (*Cirrhencyrtus*) 209

209 (208) Propodeum medially at least one-sixth as long as scutellum and with rough sculpture centrally (as in Fig. 121). Frontovertex and eyes with distinct long setae. Scutellum only slightly convex. Forewing with setae in basal cell longer than those in centre of wing . . . . ***RHYTIDOTHORAX*** (p. 226)

– Propodeum medially at most one-eighth as long as scutellum and without sculpture centrally. Frontovertex and eyes not usually with conspicuous long setae. Forewing with setae in basal cell usually not, or hardly, longer than those in centre of wing. Scutellum usually distinctly convex 210

210 (209) Mesoscutum and scutellum clothed in conspicuous dark setae, notaular lines completely absent. Gaster very short, at most as long as scutellum (care! if material has been in alcohol gaster may be distended) . . . . . ***APHYCOMORPHA*** (p. 175)

– Mesoscutum and scutellum usually with pale setae, at most scutellum with conspicuous dark setae, notaular lines usually anteriorly indicated or complete. Gaster much longer than scutellum 211

211 (210) Mandibles bidentate, or with third (upper) tooth rudimentary. Marginal vein about three times as long as broad. Setae on scutellum often dark and conspicuous. Exserted part of ovipositor over half as long as gaster. Hypopygium reaching apex of gaster . . . . ***CIRRHENCYRTUS*** (p. 187)

– Mandibles with three acute teeth. Marginal vein more or less punctiform. Setae on mesoscutum and scutellum pale. Exserted part of ovipositor rarely as long as half length of gaster. Hypopygium occasionally reaching apex of gaster . . . . . ***METAPHYCUS*** (p. 212)

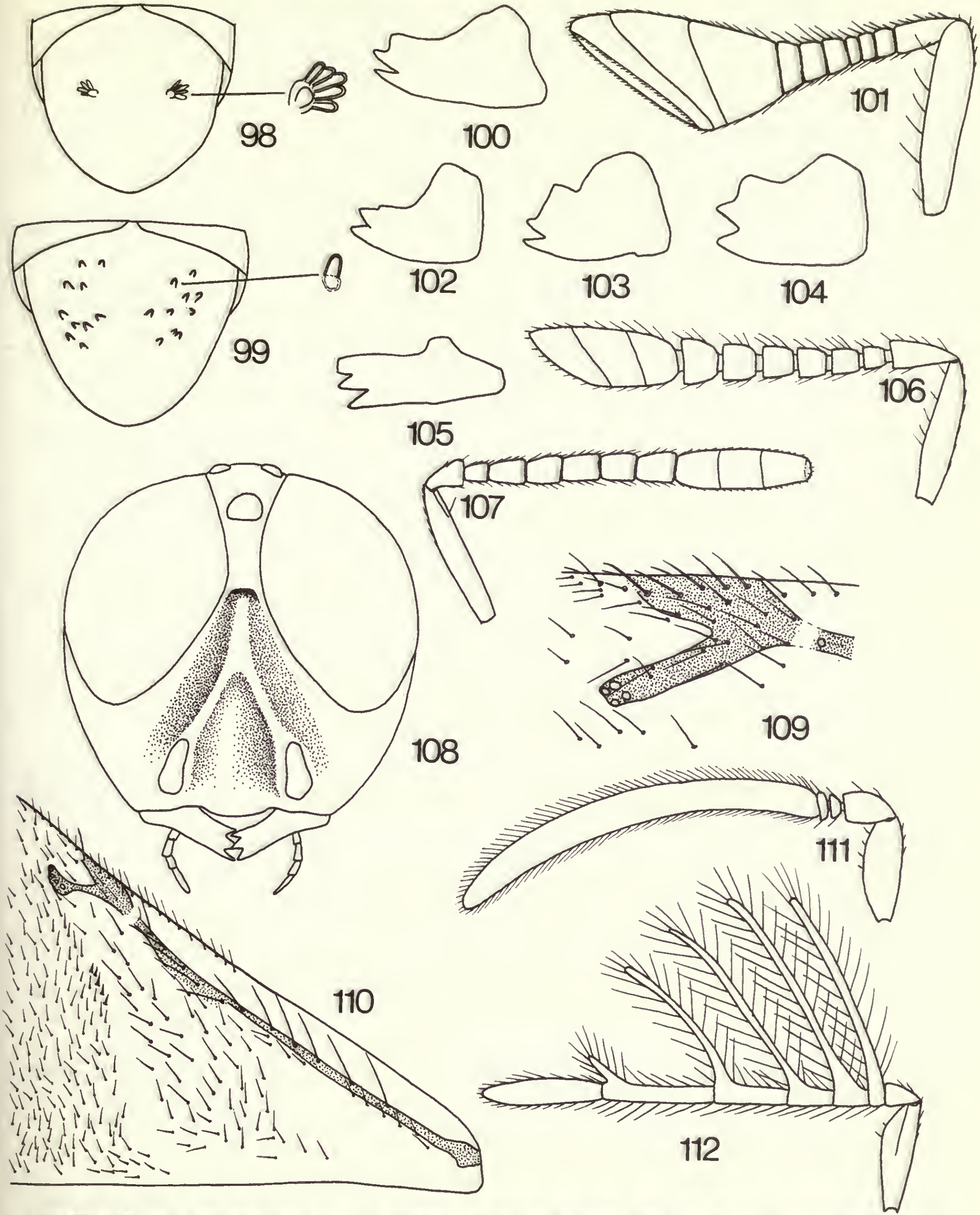
212 (207) Head with at least three pale membranous lines, two of which run near inner eye margins from near anterior ocellus to near antennal toruli and a third transverse line which connects these near the top of the antennal scrobes (Fig. 95 also as in 128) Body slightly dorso-ventrally flattened, mandibles tridentate 213

– Head without membranous lines. 214

213 (212) Clava entire . . . . ***SZELENYIOLA*** (p. 231)

Clava three-segmented . . . . ***AVETIANELLA*** (p. 179)

214 (212) Body dorso-ventrally flattened. Cerci situated about half way along gaster. Ovipositor not or hardly visible. Mandibles bidentate. . . . . . . ***RHOPUS*** (p. 226)



Figs 98–112 98, *Forcipestricis* sp. ♀, scutellum showing tubercles; 99, *Forcipestricis gazeaui* Burks ♀, scutellum showing tubercles; 100, *Coelopencyrtus gargaris* (Walker) ♀, left mandible; 101, *Epiencyrtus* sp. ♀, left antenna, outer aspect; 102, *Papaka confusor* sp. n. ♀, left mandible; 103, *Neococcidencyrtus crouzelae* De Santis ♀, left mandible; 104, *Grissellia terebrata* sp. n. ♀, left mandible; 105, *Copidosoma* sp. ♀ near *silvestrii* (Costa Lima), left mandible; 106, *Amaurilyma* sp. ♀, left antenna, outer aspect; 107, *Copidosoma* sp. ♀ near *silvestrii* (Costa Lima), right antenna, outer aspect; 108, *Cicoencyrtus angustifrons* sp. n. ♀, head, frontal aspect; 109, *Copidosoma* sp. ♀ near *silvestrii* (Costa Lima), left forewing venation, upper surface; 110, *Grissellia terebrata* sp. n. ♀, left forewing base, upper surface; 111, *Anabrolepis zetterstedtii* (Westwood) ♂, left antenna, outer aspect; 112, *Anarhopus sidneyensis* Timberlake ♂, left antenna, outer aspect.

– Body not dorso-ventrally flattened, or, if slightly flattened then cerci are nearer to base of gaster than to middle, or mandibles are not bidentate, or the exserted part of the ovipositor is at least as long as about one-quarter length of gaster 215

215 (212) Clava one- or two-segmented 216
– Clava three-segmented 223

216 (215) Clava one-segmented 217
– Clava two-segmented 220

217 (216) Notaular lines present in anterior half of mesoscutum. Head and large areas of thorax yellow or orange . . . . ***ISODROMUS*** (p. 206)
– Mesoscutum entire. Head and thorax dark 218

218 (217) Apex of clava obliquely truncate (Fig. 96). Postmarginal vein shorter than stigmal . ***LITOMASTIX*** (p. 208)
– Apex of clava apically rounded or only very slightly truncate. Postmarginal vein distinctly longer than stigmal (as in Fig. 130) 219

219 (218) Mesoscutum shiny with shallow, transverse sculpture contrasting with the deep, longitudinally semi-striate sculpture of scutellum which is silky in appearance. First two funicle segments not much shorter than third . . ***PARALEUROCERUS*** (p. 219)
– Both mesoscutum and scutellum with longitudinal, semi-striate sculpture and both more or less silky in appearance. Each of first two funicle segments about half as long as third . . . . ***AGENIASPIS*** (p. 171)

220 (216) Antennal torulus separated from mouth margin by much less than own length. Body at least slightly dorso-ventrally flattened. Mesoscutum entire. Cerci situated about half way along gaster. Mandibles with three acute teeth. 221
– Antennal torulus separated from mouth margin by about own length. Body occasionally slightly dorso-ventrally flattened. Mesoscutum sometimes with notaular lines anteriorly indicated. Cerci situated near apex of gaster. Mandibles with two teeth and a truncation, or quadridentate 222

221 (220) Antennal scrobes moderately impressed and horseshoe-shaped. Protruding part of ovipositor equal to about one-quarter length of gaster and more or less straight, not curved downwards towards apex. Frontovertex with distinct sculpture . . . ***TANYENCYRTUS*** (p. 231)
– Antennal scrobes absent or represented by extremely short, shallow grooves, much shorter than the length of an antennal torulus (Fig. 41). Protruding part of ovipositor equal to at least about half length of gaster and curved downwards towards apex. Frontovertex highly polished . . . . ***SHENAHETIA*** (p. 227)

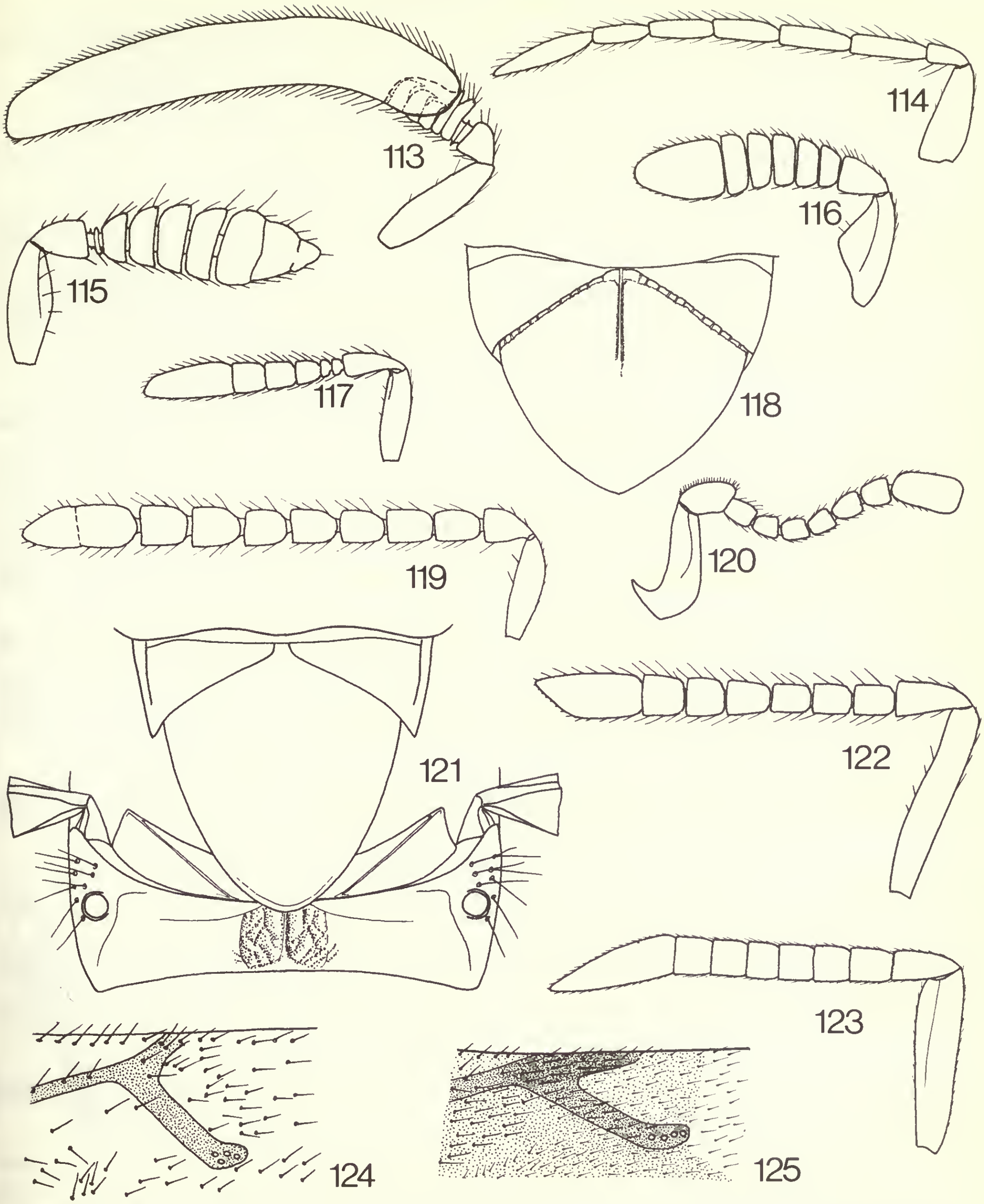
222 (220) Mandibles quadridentate. Notaular lines anteriorly indicated . . . . . . ***ANDINOENCYRTUS*** (p. 174)
– Mandibles bidentate with truncation. Mesoscutum entire . . . . [***Coccidencyrtus***] ***obesus*** De Santis (p. 188)

223 (215) Exserted part of ovipositor at least as long as half length of gaster. Hypopygium extending well past apex of epipygium so that it is clearly visible in dorsal view (Fig. 89). Postmarginal vein longer than stigmal . . ***COCCIDOCTONUS*** (p. 188)
– Ovipositor not or hardly protruding, or, if as long or longer than half length of gaster then hypopygium does not extend past apex of epipygium and postmarginal vein is not longer than stigmal 224

224 (223) Scutellum smooth and shiny, not sculptured except occasionally at extreme base . 225
– At least anterior half of scutellum with distinct sculpture (occasionally quite shallow) 228

225 (224) Hypopygium clearly reaching apex of gaster. Frontovertex and mesoscutum often with thimble-punctured sculpture . . . . ***ZETETICONTUS*** (p. 236)
– Hypopygium reaching at most two-thirds along gaster, usually no more than half way. Frontovertex and mesoscutum never with thimble-punctured sculpture 226

226 (225) Propodeum medially at least one-sixth as long as scutellum and with rough central area which contrasts with smooth lateral areas (as in Fig. 121). Frontovertex and eyes with



Figs 113–125 113, *Aenasius advena* (Compere) ♂, left antenna, outer aspect; 114, *Helegonatopus pseudophanes* Perkins ♂, left antenna, outer aspect; 115, *Blanchardiscus* sp. ♂, right antenna, outer aspect; 116, *Hambletonia pseudococcina* Compere ♂, left antenna, outer aspect; 117, *Ameromyzobia aphelinoides* Girault ♂, left antenna, outer aspect; 118, *Hambletonia pseudococcina* Compere ♂, scutellum in dorsal view; 119, *Desobius* sp. ♂, left antenna, outer aspect; 120, *Coelopencyrtus gargaris* (Walker) ♂, right antenna, outer aspect; 121, *Rhytidothorax* sp. ♂, scutellum and propodeum in dorsal view; 122, *Litomastix truncatella* (Dalman) ♂, left antenna, outer aspect; 123, *Homalotylus flaminius* (Dalman) ♂, left antenna, outer aspect; 124, *Isodromus iceryae* Howard ♂, right forewing venation, upper surface; 125, *Homalotylus flaminius* (Dalman) ♂, right forewing venation, upper surface.

very distinct long setae. Scutellum without tubercles. Mandibles unidentate or bidentate . . . . ***RHYTIDOTHORAX*** (p. 226)

– Propodeum medially at most one-eighth as long as scutellum and without distinct central rough area. Frontovertex and eyes without long setae, or, if present, then either scutellum has tubercles (Fig. 98, also cf. Fig. 99) (best seen in cleared slide mounts) or mandibles are tridentate 227

227 (226) Scutellum distinctly convex in side view with tubercles or pits (Fig. 98, also cf. Fig. 99) (best seen in cleared slide mounts). Frontovertex smooth and shiny, or rarely sculptured, always with conspicuous long setae. Eyes hairy. Mandibles bidentate or tridentate with middle tooth longest . . . . ***FORCIPESTRICIS*** (p. 196)

– Scutellum almost flat and without tubercles. Frontovertex with distinct sculpture and without any very conspicuous long setae. Eyes not conspicuously hairy. Mandibles with three teeth of about equal length . . . . ***HABROLEPOIDEA*** (p. 199)

228 (224) Apex of scutellum with tuft of setae, or, if tuft indistinct then usually at least posterior one-third of mesoscutum clothed in white setae which contrast strongly with dark colour of mesoscutum. Scutellum not shiny. Submarginal vein slightly expanded in its apical three-quarters . . . . ***ZAOMMA*** (p. 235)

– Apex of scutellum without tuft of setae, at most with few longer upright setae. Mesoscutum without contrasting pale setae, or, if pale setae present then submarginal vein is not expanded apically 229

229 (228) Both mesoscutum and scutellum with fine, longitudinal, more or less striate sculpture giving both a silky appearance. Clava as long or longer than funicle (Fig. 160) . ***DESOBIUS*** (p. 192)

– Thorax sculpture different: at most either only scutellum or mesoscutum with striate sculpture, never both. Clava occasionally as long or longer than funicle, but usually shorter 230

230 (229) Notaular lines present in anterior half of mesoscutum, or complete 231

– Notaular lines absent or indicated at extreme anterior margin of mesoscutum only . 233

231 (230) Setae on dorsal surface of forewing, proximal to the speculum, in four lines, remainder of basal cell naked. Scutellum with deeper more elongate sculpture than mesoscutum. Notaular lines complete. Gaster completely yellow ventrally . . . . ***CIBDELOENCYRTUS*** (p. 185)

– Basal cell more or less completely pilose, although occasionally sparsely pilose towards base. Sculpture of scutellum more or less the same as mesoscutum. Notaular lines not complete, extending about half way across mesoscutum. Venter of gaster not yellow, except perhaps in some *Metaphycus* 232

232 (231) Marginal vein at least one and a half times as long as broad. Mid tibia without dark rings . . . . ***SOLENOENCYRTUS*** (p. 230)

– Marginal vein punctiform, or hardly longer than broad. Mid tibia yellow, usually with dark rings . . . . ***METAPHYCUS*** (p. 212)

233 (230) Mesoscutum dark brown or black, not shiny or metallic, posterior margin of pronotum usually white or distinctly paler than mesoscutum. Hypopygium never extending to apex of gaster. Mandibles with three acute teeth . . . . ***METAPHYCUS*** (p. 212)

– Mesoscutum at least slightly shiny, posterior margin of pronotum the same colour as mesoscutum, or darker and not distinctly paler. Hypopygium often reaching apex of gaster 234

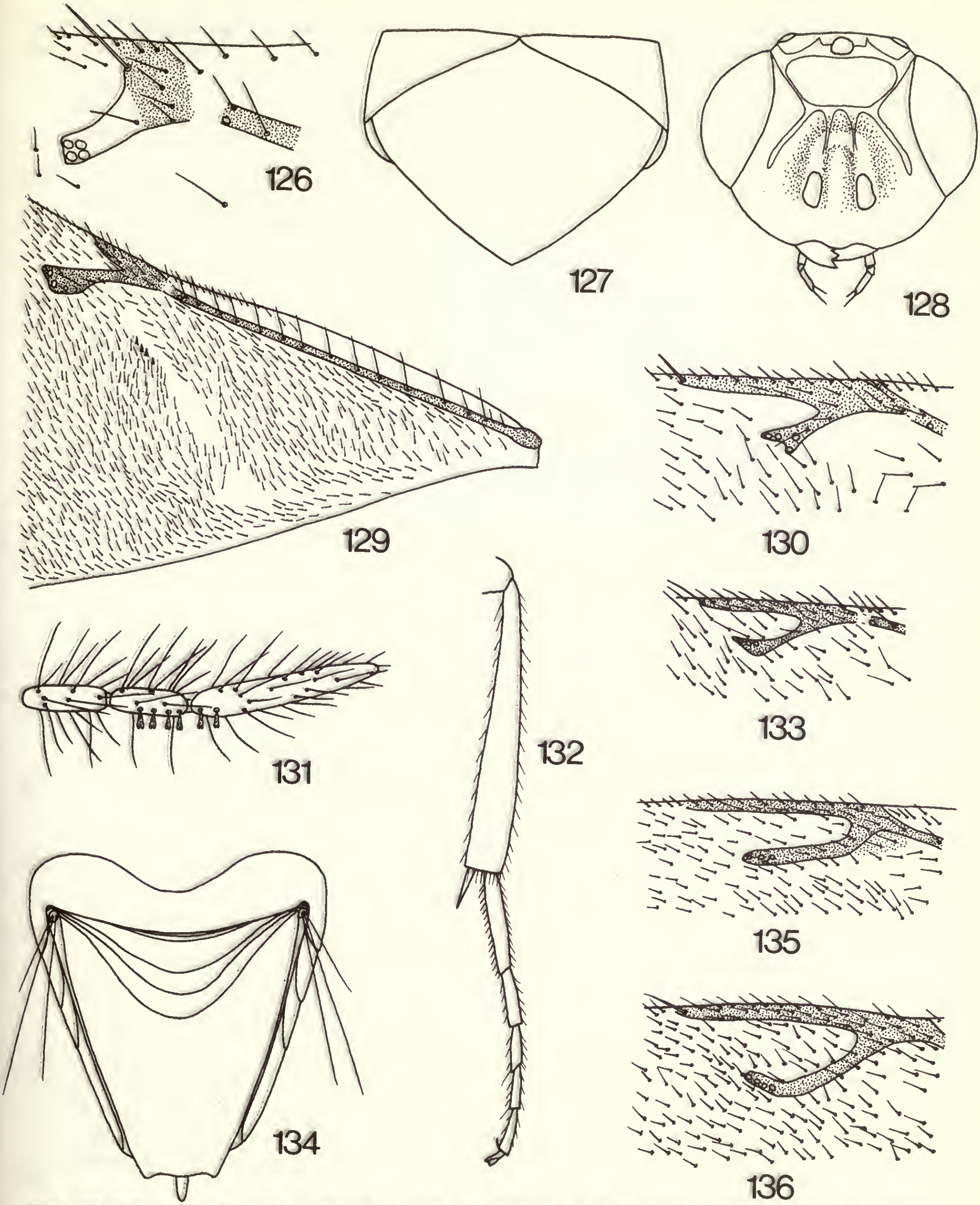
234 (233) Mandibles unidentate or bidentate 235

– Mandibles tridentate (third (upper) tooth sometimes rudimentary) or with one or two teeth and a truncation 238

235 (234) Hypopygium convex, more or less boat-shaped and reaching apex of gaster . . . 236

– Hypopygium hardly convex, reaching at most to three-quarters along gaster . . . 237

236 (235) Postmarginal vein very short, much shorter than stigmal, submarginal vein with a triangular expansion in its apical third (as in Fig. 20). Frontovertex with reticulate sculpture. Body not robust . . . . ***PAURIDIA*** (p. 221)



Figs 126–136 126, *Pentalitomastix plethoricus* Caltagirone ♂, left forewing venation, upper surface; 127, *Baeoencyrtus platys* De Santis ♂, scutellum in dorsal view; 128, *Avetianella* sp. ♂, head in frontal aspect; 129, *Metaphycus* sp. ♂, left forewing base, upper surface; 130, *Ageniaspis fuscicollis* (Dalman) ♂, left forewing venation, upper surface; 131, *Anagyrus* sp. ♂, apical segments of right antenna to show perpendicular sensillae; 132, *Hunterellus hookeri* Howard ♂, left hind tibia and tarsus, outer aspect; 133, *Microterys* ? *flavus* (Howard) ♂, left forewing venation, upper surface; 134, *Anagyrus* sp. ♂, gaster in dorsal view; 135, *Prionomastix* sp. ♂, left forewing venation, upper surface; 136, *Encyrtus infelix* (Embleton) ♂, left forewing venation, upper surface.

– Postmarginal vein much longer than stigmal, submarginal vein without triangular expansion. Frontovertex with thimble-punctured sculpture. Body very robust . . ***BLEPYRUS*** (p. 182)

237 (235) Scutellum with tubercles or pits (as in Figs 98, 99) (best seen in cleared slide mounts). Frontovertex almost always smooth and shiny. Propodeum short medially, at most one-sixth as long as scutellum and smooth. Proximal funicle segments often anelliform, contrasting with longer distal segments. Mandibles bidentate. . . ***FORCIPESTRICIS*** (p. 196)

– Scutellum without tubercles or pits. Frontovertex with distinct sculpture and not very shiny. Propodeum medially usually longer than one-sixth scutellum, sculptured centrally and contrasting with the smoother lateral areas (as in Fig. 121). Funicle segments usually becoming shorter distally. Mandibles unidentate (Fig. 54) or bidentate (Figs 55, 56) . . . . ***RHYTIDOTHORAX*** (p. 226)

238 (234) Propodeum shiny and with distinct median carina and medially at least one-fifth as long as the flat scutellum which has deeper more elongate sculpture than mesoscutum. Submarginal vein with triangular expansion in its apical one-third (Fig. 57) (often indistinct). Marginal vein at least twice as long as broad. Occipital margin more or less rounded . . . . ***PARECHTHRODRYINUS*** (p. 221)

– Propodeum normally without distinct median carina and medially at most one-sixth as long as scutellum, or, if longer and with median carina, then scutellum distinctly convex, submarginal vein usually without a triangular expansion and occipital margin acute. Marginal vein often punctiform and scutellum occasionally with elongate sculpture 239

239 (238) Scutellum with distinct tubercles or pits, either scattered or in a distinct group on each side (as in Figs 98, 99) (best seen in cleared slide mounts). Frontovertex with conspicuous long setae and almost always smooth and very shiny. Eyes very hairy. Hypopygium not reaching apex of gaster.

Mandibles with middle tooth longest. Antennae often with at least one or two proximal funicular segments anelliform, contrasting with distal segments which are subquadrate . . . . ***FORCIPESTRICIS*** (p. 196)

– Scutellum without tubercles or pits, or, if some present then hypopygium reaches apex of gaster (*Amaurilyma*). Frontovertex with distinct sculpture and usually without long conspicuous setae. Eyes rarely very hairy 240

240 (239) Exserted part of ovipositor well over half length of gaster. Frontovertex very narrow, at narrowest point at most about one-fifth head width and sometimes only slightly wider than anterior ocellus (Fig. 108) . . . . . . ***CICOENCYRTUS*** (p. 186)

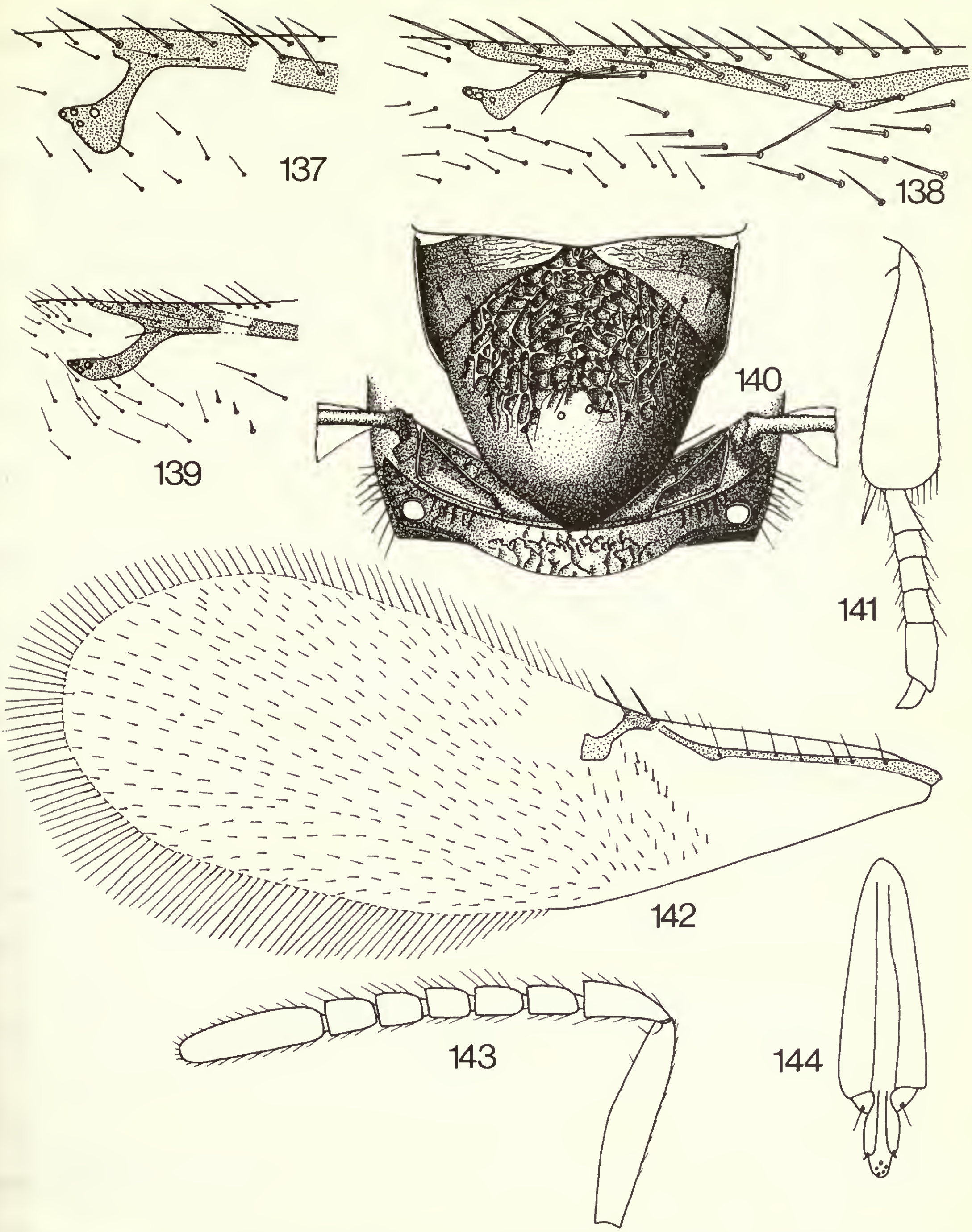
– Ovipositor not or hardly protruding, never with protruding part as long as half length of gaster. Frontovertex never as narrow as above, or, if as narrow (*Euryrhopalus*) then ovipositor more or less hidden 241

241 (240) Clava large, about twice as wide as sixth funicle segment and longer than funicle and with a very strong oblique truncation which is longer than length of ventral surface of clava, all funicle segments transverse and unicolorous (Fig. 101). Marginal vein about three times as long as broad. Hypopygium not reaching apex of gaster . . . ***EPIENCYRTUS*** (p. 195)

– Clava usually relatively smaller (although sometimes much longer than funicle) and with rounded apex, or, if truncate then truncation is transverse and marginal vein is punctiform, or, if truncation is oblique then it is very short, much shorter than length of ventral side of clava and the clava is shorter than funicle or the hypopygium reaches the apex of gaster 242

242 (241) Scutellum at most, only slightly convex, more or less flat, not shiny, relatively shallow in side view and with deep punctate or elongate sculpture which is distinctly deeper than that on shiny mesoscutum (except in *Papaka* where mesoscutum may also have punctate sculpture), sculpture never shallower than that on mesoscutum. Head often triangular in side view with frontovertex flat in profile 243

– Scutellum distinctly convex, or, if dorsally flat then sides are long and convex and it is relatively deep in side view, or it is rather shiny with very much shallower sculpture



Figs 137–144 137, *Shenahetia masneri* sp. n. ♂, left forewing venation, upper surface; 138, *Parechthrodryinus nitidus* (Howard) ♂, left forewing venation, upper surface; 139, *Tanyencyrtus divisus* De Santis ♂, left forewing venation, upper surface; 140, *Helegonatopus* sp. ♂, scutellum and propodeum in dorsal view; 141, 142, *Arrhenophagoidea* sp., ♀, (141) left hind tibia and tarsus, outer aspect, (142) left forewing, upper surface; 143, 144, *Arhopoidiella carinata* sp. n., ♂, (143) left antenna, outer aspect, (144) genitalia.

than mesoscutum. Scutellum only occasionally with deeper sculpture than mesoscutum. Head rounded in profile 248

243 (242) Mandibles with four acute teeth (Fig. 46). Mid tibia completely yellow without dark bands . . . . ***ADELENCYRTUS*** (p. 170)

– Mandibles with one tooth or two teeth and a truncation (the latter may have the truncate third (upper) tooth rudimentary (Fig. 102)). Mid tibia often brown or yellow with dark bands 244

244 (243) Frontovertex, at narrowest point, at least one-third head width. Clava yellow or testaceous, funicle usually concolorous or slightly paler, rarely darker. Clava long, almost as long as, or longer than, funicle, usually much longer . . . . . ***COCCIDENCYRTUS*** (p. 188)

– Frontovertex, at narrowest point, at most one-quarter head width. Clava and first four funicle segments brown, often segments five and six yellowish or testaceous. Clava at most as long as funicle 245

245 (244) Sides and apex of scutellum steep, flat and polished. Clava about as long as funicle and segments five and six of funicle usually yellow . ***NEOCOCCIDENCYRTUS*** (p. 216)

– Sides of scutellum short and convex, not flat or polished. Clava at most about two-thirds as long as funicle, or, if longer then funicle segments five and six are concolorous with rest of funicle 246

246 (245) Mandibles with upper tooth rudimentary, almost absent (Fig. 102). Sixth funicle segment often yellow and contrasting with rest of funicle and clava. Setae on funicle short, the longest much shorter than diameter of first funicle segment ***PAPAKA*** (p. 217)

– Mandibles with third (upper) tooth broad and truncate (Fig. 104). Sixth funicle segment concolorous with rest of flagellum. Setae on funicle long, the longest at least as long as diameter of first funicle segment 247

247 (246) Postmarginal vein distinct, nearly as long as stigmal (as in Fig. 110) ***GRISSELLIA*** (p. 197)

– Postmarginal vein more or less absent or extremely short (as in Fig. 76) . . . . ***OOENCYRTUS*** (p. 217)

248 (242) Antenna with funicle not unicolorous, with contrasting dark and light segments. . ***PARALITOMASTIX*** (p. 219)

– Antenna with funicle unicolorous without contrasting dark and light segments . . 249

249 (248) Postmarginal vein much longer than stigmal 250

– Postmarginal vein not longer than stigmal 251

250 (249) Frontovertex, at narrowest point, at least one-sixth head width . ***BLEPYRUS*** (p. 182)

– Frontovertex, at narrowest point, at most one-eighth head width . . . . . ***EURYRHOPALUS*** (p. 196)

251 (249) Hypopygium reaching apex of gaster, or, if reaching to only four-fifths of gaster then marginal vein punctiform (Fig. 109) and mandibles have three acute teeth (Fig. 97) (if third (upper) tooth blunt (Fig. 105) then clava transversely truncate (Fig. 107)) . 252

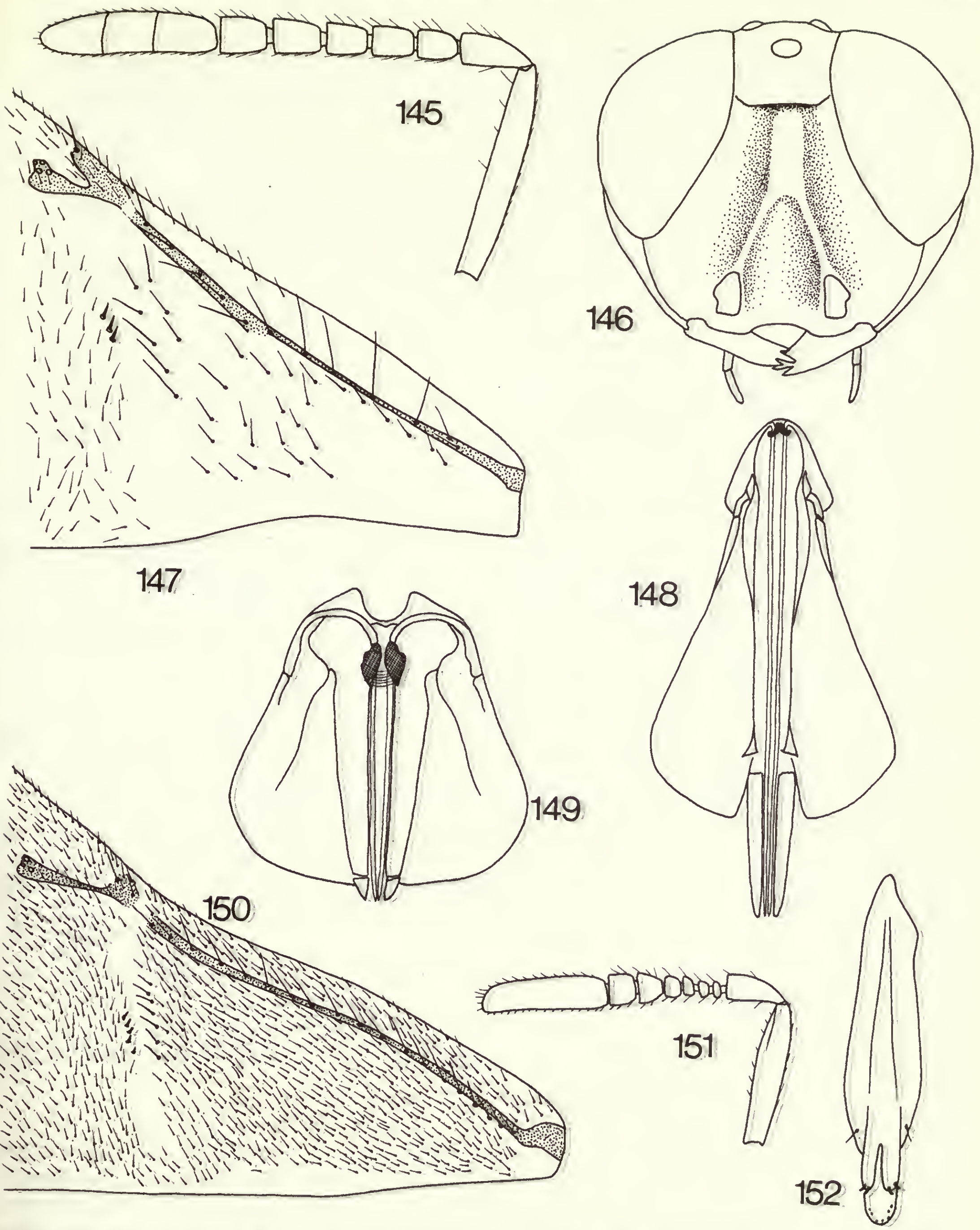
– Hypopygium, at most, reaching just over half way along gaster. Marginal vein distinctly longer than broad, or, if punctiform then mandibles have at most two acute teeth (if with third (upper) tooth developed and blunt then clava apically rounded or distinctly obliquely truncate) 254

252 (251) Antenna very short, about as long as width of head, mandibles with third (upper) tooth apically rounded or truncate (Fig. 100) . . . . . ***COELOPENCYRTUS*** (p. 189)

– Antenna longer, at least one and a half times as long as width of head. Mandibles with upper tooth acute 253

253 (252) Antenna with clava obliquely truncate (Fig. 106). Scutellum with very deep, rough, longitudinal sculpture and short, thin, apical extension (Fig. 94) . . . . . ***AMAURILYMA*** (p. 171)

– Antenna with clava apically rounded or with transverse truncation (Fig. 107) not obliquely truncate. Scutellum not with rough longitudinal sculpture and without apical extension. . . . . ***COPIDOSOMA*** (p. 189)



Figs 145–152 145–148, *Arhopoidiella carinata* sp. n. ♀, (145) left antenna, outer aspect, (146) head in frontal aspect; (147) left forewing base, upper surface, (148) genitalia; 149, 150, *Bennettisca flavigena* sp. n. ♀, (149) genitalia, (150) left forewing base, upper surface; 151, 152, *Cicoencyrtus angustifrons* sp. n. ♂, (151) left antenna, outer aspect, (152) genitalia.

254 (251) Posterior margin of mesoscutum gently curved or slightly angled so that axillae appear to be more or less touching apically (Fig. 78). Forewing: marginal vein punctiform or hardly longer than broad, stigmal vein long and postmarginal distinct, longer than marginal (Fig. 75). Antenna with setae relatively short, the longest much shorter than half diameter of the first funicle segment. Mesoscutum bright metallic green or blue-green.
Parasites of psyllid nymphs . . . . . . ***PSYLLAEPHAGUS*** (p. 226)

– Posterior margin of mesoscutum usually rather convex in median third so that axillae appear to be widely separated (as in Fig. 77). Marginal vein at least about twice as long as broad, or, if punctiform (as in Fig. 76) then stigmal is short, not longer than marginal and postmarginal very short or indistinct, not longer than marginal and axillae distinctly separated by posterior margin of mesoscutum. Antenna with setae relatively longer, the longest at least half as long as diameter of the first funicle segment; mesoscutum occasionally green or blue-green but never very bright . . 255

255 (254) Marginal vein punctiform, rarely longer than broad and often relatively thick, stigmal vein short, almost sessile, postmarginal vein very short or absent (as in Fig. 76).
Egg parasites . . . . ***OOENCYRTUS*** (p. 217)

– Marginal vein at least one and a half times, and usually at least twice, as long as broad, stigmal vein always relatively long and postmarginal always distinct and as long or nearly as long as stigmal (as in Fig. 74) (occasionally marginal vein punctiform, but postmarginal vein nearly as long as stigmal vein) 256

256 (255) Scutellum quite flat and shiny with very shallow inconspicuous sculpture. Eyes and frontovertex with very distinct, long, dark setae. . . . ***EXORISTOBIA*** (p. 196)

– Scutellum never flat and shiny, usually distinctly convex or with deep sculpture. Eyes and frontovertex without conspicuous setae, or, if these are present then scutellum very convex or with deep, conspicuous sculpture 257

257 (256) Scutellum (without axillae) at most as long as broad, usually broader than long and almost uniformly convex, sculpture (of scutellum) often deeply punctate, particularly in basal half, apical half or third often smooth and shiny. Eyes usually rather hairy. Marginal vein sometimes punctiform . . . . ***ECHTHRODRYINUS*** (p. 193)

– Scutellum (without axillae) longer than broad and normally abruptly convex at sides and apex, sculpture uniform and never deeply punctate, occasionally striate (in latter case the extreme apex is quite shiny). Eyes more or less naked. Marginal vein always distinctly longer than broad 258

258 (257) Scutellum longitudinally striate and with silky lustre . ***MERCETENCYRTUS*** (p. 211)

– Scutellum longitudinally striate and without silky lustre 259

259 (258) Setae on flagellum finer and shorter, usually with the longest not longer than diameter of first funicle segment. Generally smaller species:— length less than 1 mm. Parasites of Aphididae (or perhaps psyllid nymphs) . . . . ***APHIDENCYRTUS*** (p. 175)

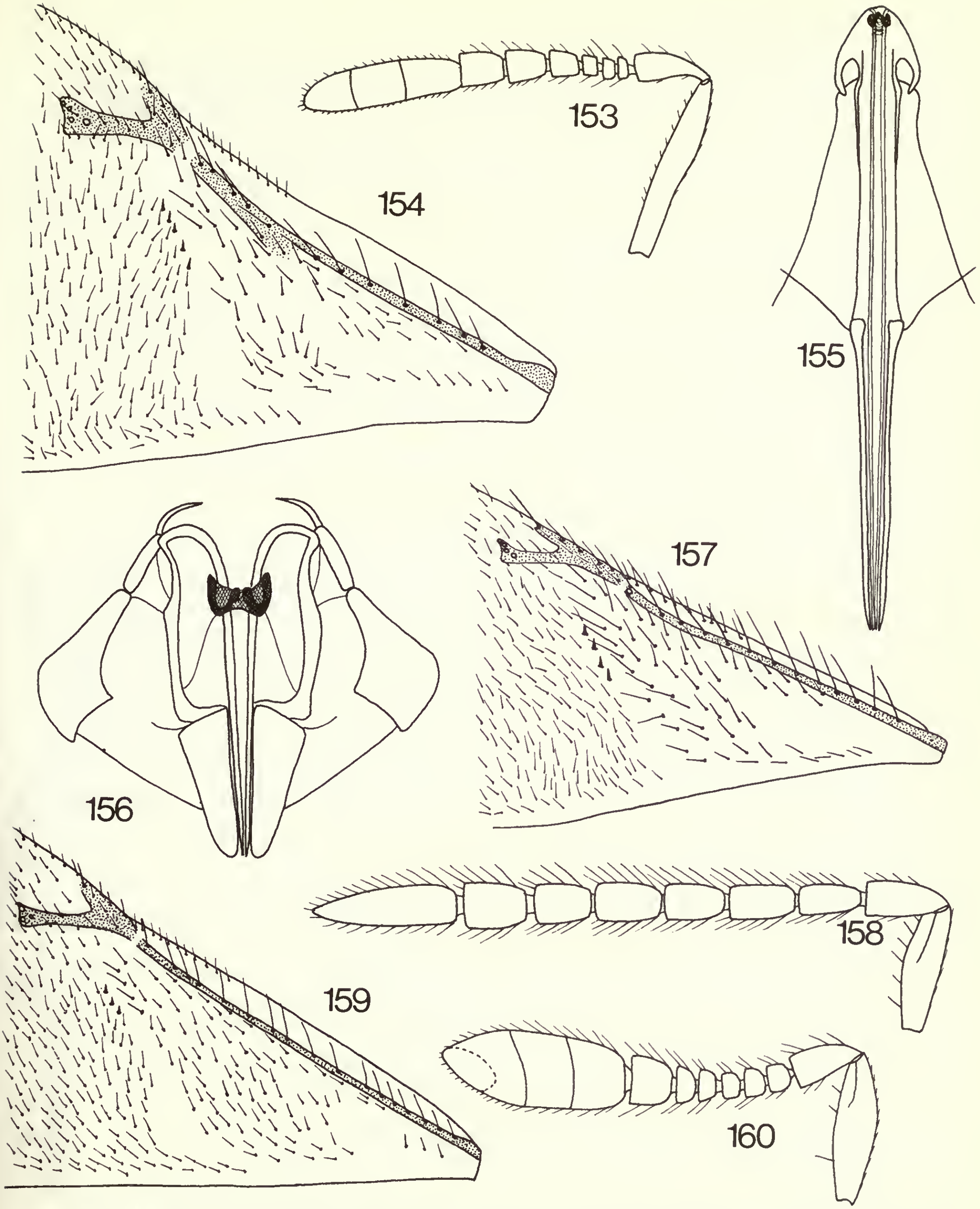
– Setae on flagellum usually coarser and longer, the longest about as long or longer than the diameter of the first funicle segment. generally larger species:— length greater than 1·5 mm. Parasites of syrphid larvae (Diptera) . . ***SYRPHOPHAGUS*** (p. 230)

Key to genera (males)

The following genera are not included because the males are unknown or their presence in the Neotropics is doubtful: *Acroaspidia, Anathrix, Andinoencyrtus, Anusioptera, Aphycomastix, Arrhenophagoidea, Atelaphycus, Aztecencyrtus, Bennettisca, Calliencyrtus, Cerchysius, Cibdeloencyrtus, Cyderius, Deloencyrtus, Dicarnosis, Ectroma, Epiencyrtus, Exoristobia, Habrolepoidea, Homosemion, Hoplopsis, Lohiella, Mariola, Moorella, Neapsilophrys, Paramucrona, Parencyrtus, Pelmatencyrtus, Pheidoloxenus, Platylyca, Prionomitus, Protyndarichoides, Simmondsiella, Solenoencyrtus, Tetarticlava, Tineophoctonus, Tyndarichoides.*

1 Funicle with long rami (Fig. 112) 2

– Funicle simple, without rami 6



Figs 153–160 153–155, *Cicoencyrtus angustifrons* sp. n. ♀, (153) left antenna, outer aspect, (154) left forewing base, upper surface, ♂, (155) genitalia; 156–158, *Amaurilyma* sp., (156) genitalia, ♀, (157) left forewing base, upper surface, ♀, (158) left antenna, outer aspect, ♂; 159, *Cyderius urbicola* sp. n. ♀, left forewing base, upper surface, 160, *Desobius convexus* sp. n. ♀, left antenna, outer aspect.

2 Funicle five-segmented . . . 3

– Funicle six-segmented . . . 4

3 (2) Fifth funicle segment with short apical ramus (Fig. 112) about one-quarter length of segment. Scutellum with slightly deeper, coarser sculpture than mesoscutum, greenish ***ANARHOPUS*** (p. 173)

– Fifth funicle segment simple. Scutellum with slightly shallower sculpture than mesoscutum, purple, contrasting with the green mesoscutum . . . ***TETRACNEMOIDEA*** (p. 233)

4 (2) First funicle segment simple and transverse . . . ***TETRACNEMUS*** (p. 233)

– First funicle segment with ramus . . . 5

5 (4) Scape not reaching anterior ocellus. Forewings hyaline. Body metallic green or blue-green . . . ***PARABLASTOTHRIX*** (p. 218)

– Scape reaching well above level of posterior ocelli. Forewings usually with some infuscate areas. Body orange to dark brown, never metallic . ***HEXACLADIA*** (p. 203)

6 (1) Funicle composed of two to five anelliform segments, clava extremely long and sausage-shaped (Figs 111, 113), more than twice (usually more than three times) as long as scape . . . 7

– If all funicle segments are anelliform then clava at most one and a half times as long as scape and not sausage-shaped . . . 8

7 (6) Mandibles with four teeth or with two acute teeth and a truncation. Funicle two-segmented, clava with base rounded and articulated to funicle in centre (Fig. 111). Marginal vein as long or longer than short stigmal, postmarginal shorter than radial ***ADELENCYRTUS*** (p. 170), ***PLAGIOMERUS*** (p. 222), ***ANABROLEPIS*** (p. 172), ***HABROLEPIS*** (p. 199), ?***HOMALOPODA*** (p. 203), ?***PSEUDHOMALOPODA*** (p. 225)

– Mandibles with two or three teeth. Funicle two- to five-segmented (sometimes in dorsal view only two segments visible, the others being hidden by base of clava, this being most easily observed in slide-mounted material), clava with base not rounded, dorsally produced towards pedicel thus partially obscuring funicle and articulated on ventral side (Fig. 113). Marginal vein more or less punctiform, postmarginal as long or longer than stigmal which is several times longer than marginal . . . ***CHALCASPIS*** (p. 184), ***AENASIUS*** (p. 170)

8 (6) Funicle of fewer than six segments . . . 9

– Funicle of six or more segments . . . 25

9 (8) Funicle three- or four-segmented, all segments more or less anelliform . . . ***BLEPYRUS*** (p. 182)

– Funicle five-segmented.
First segment may be anelliform or partially obscured by pedicel or second funicle segment giving funicle a four-segmented appearance . . . 10

10 (9) Mesoscutum with notaular lines complete (as in Fig. 8) or extending at least about quarter of way towards posterior margin of mesoscutum . . . 11

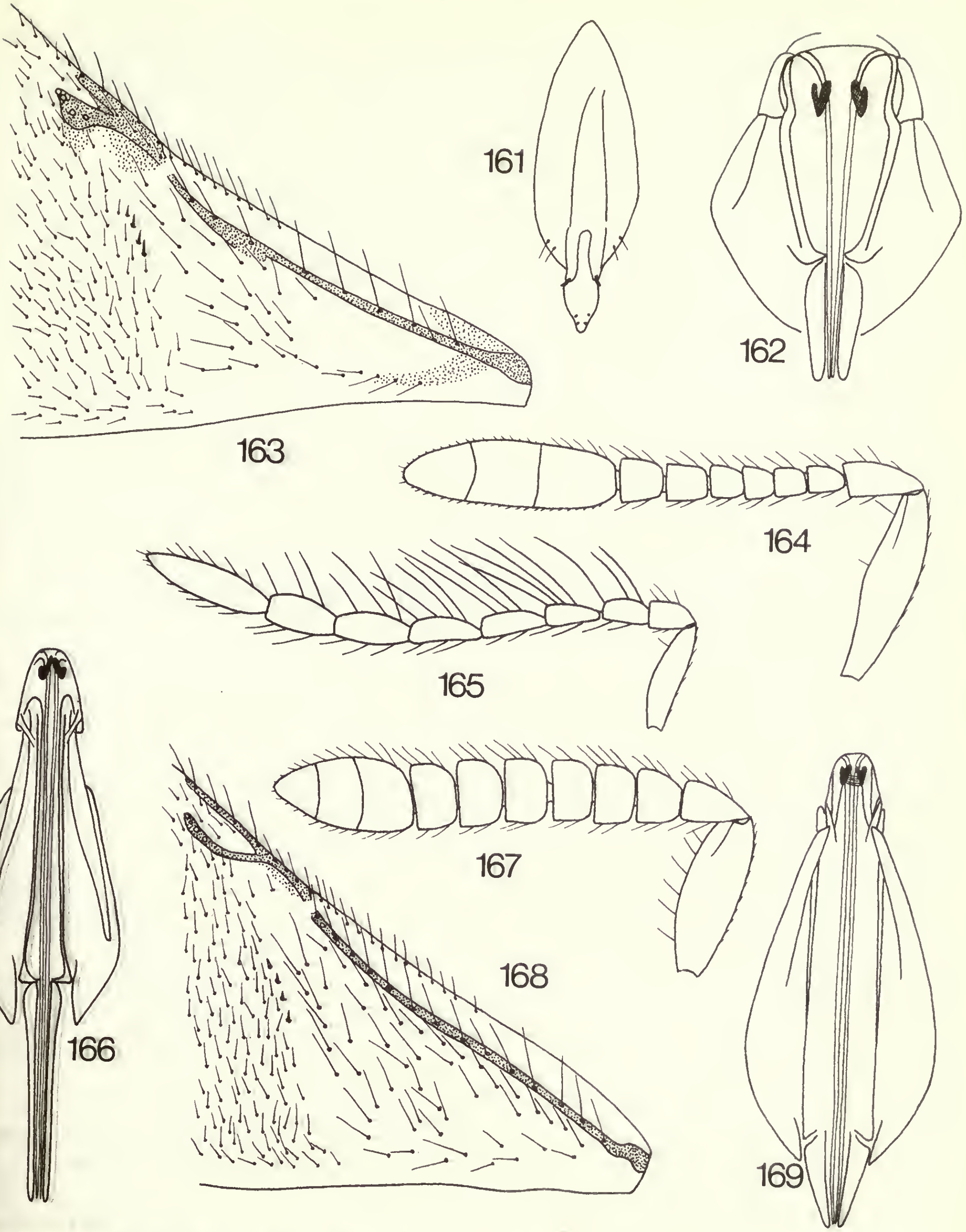
– Notaular lines completely absent, or indicated only at extreme anterior margin of mesoscutum . . . 14

11 (10) Notaular lies only visible in anterior half of mesoscutum . . . 12

– Notaular lines complete or very nearly reaching posterior margin of mesoscutum . 13

12 (11) First funicle segment anelliform, the remaining four much longer than broad and with very short setae, shorter than one-third diameter of segments. Propodeum at least one-third length of scutellum and shiny. Forewing with a large infumate area below marginal vein extending to posterior margin of wing . ..***MEROMYZOBIA*** (p. 212)

– First funicle segment at least about as long as broad, not shorter than remainder. Setae on funicle well over half diameter of segments. Propodeum at most one-fourth as long as scutellum and not very shiny. Forewing very slightly infumate in anterior half .. ***ACEROPHAGOIDES*** (p. 169)



Figs 161–169 161, *Desobius* sp. ♂, genitalia; 162, 163, *Desobius convexus* sp. n. ♀, (162) genitalia, (163) left forewing base, upper surface; 164, *Grissellia terebrata* sp. n. ♀, left antenna, outer aspect, ♀; 165, *Grissellia* sp. ♂, left antenna, outer aspect; 166, *Grissellia terebrata* ♀, genitalia; 167, *Exoristobia* sp. ♀, left antenna, outer aspect; 168, *Exoristobia* sp. ♀, left forewing base, upper surface; 169, *Exoristobia* sp. ♀, genitalia.

13 (11) Thorax yellow or orange, scutellum with apex well rounded and with sculpture not deeper than that on mesoscutum . . . . . . ***SOLENAPHYCUS*** (p. 230)

– Thorax dark and metallic. Scutellum with apex more or less pointed and with sculpture distinctly deeper and coarser than that on mesoscutum . ***COCCIDAPHYCUS*** (p. 187)

14 (10) Wings absent . . . . ***STEMMATOSTERES*** (p. 230)

– Wings fully developed or extending past apex of gaster 15

15 (14) Antennae about as long as body, all funicle segments at least about twice as long as broad and with setae at least as long as diameter of segments, scape triangular and broadest at base (Fig. 114). Body metallic green . . ***HELEGONATOPUS*** (p. 200)

– Antennae much shorter than body, generally not more than half as long, usually some funicle segments transverse or subquadrate, rarely all longer than broad, none as much as twice as long as broad, setae on funicle shorter than diameter of segments, scape usually widest at about middle. Body often orange, rarely green . . . 16

16 (15) Clava two-segmented, funicle with a small, very transverse first segment, the remainder much longer and each about twice as broad as long (Fig. 115). Scutellum produced apically in a tongue-like extension which curls downwards towards the posterior margin of propodeum (Fig. 12) . . . . . ***BLANCHARDISCUS*** (p. 182)

– Clava entire, funicle not as above, scutellum not produced apically 17

17 (16) Postmarginal vein longer than stigmal . . . . ***EURYRHOPALUS*** (p. 196)

– Postmarginal vein not longer than stigmal 18

18 (17) Scutellum with central ridge which arises between the apices of the axillae and extends posteriorly for about half its length (Fig. 118). Scape triangular in side view, about twice as long as broad and widest in the middle (Fig. 116). Mandibles bidentate . ***HAMBLETONIA*** (p. 200)

– Scutellum without central ridge. Scape not triangular, if broadened then ventral edge gradually curved. Mandibles tridentate 19

19 (18) Head and thorax dark orange-brown to black and at least moderately shiny. Pronotum not paler than mesoscutum. Neither mesoscutum nor scutellum with contrasting pale setae 20

– Head and thorax usually orange or yellow, or, if dark then matt and without metallic reflections and with contrasting pale setae and pronotum distinctly paler than mesoscutum 22

20 (19) Eyes covered with numerous short hairs. Interantennal prominence not covered in dense white setae 21

– Eyes naked. Interantennal prominence clothed in dense white setae ***ARCHINUS*** (p. 176)

21 (20) All funicle segments transverse, clava about as long as funicle. Top of antennal scrobes without carina. Legs completely yellow . . . . ***BOTHRIOCRAERA*** (p. 182)

– All funicle segments longer than broad, clava much shorter than funicle (Fig. 143), top of antennal scrobes often with a distinct carina which runs transversely from eye to eye (as in Fig. 146). Legs darkened . . . . . ***ARHOPOIDIELLA*** (p. 177)

22 (19) First two funicle segments anelliform, their combined lengths less than length of third which is more or less subquadrate as are remaining segments (Fig. 117) . . . ***AMEROMYZOBIA*** (p. 172)

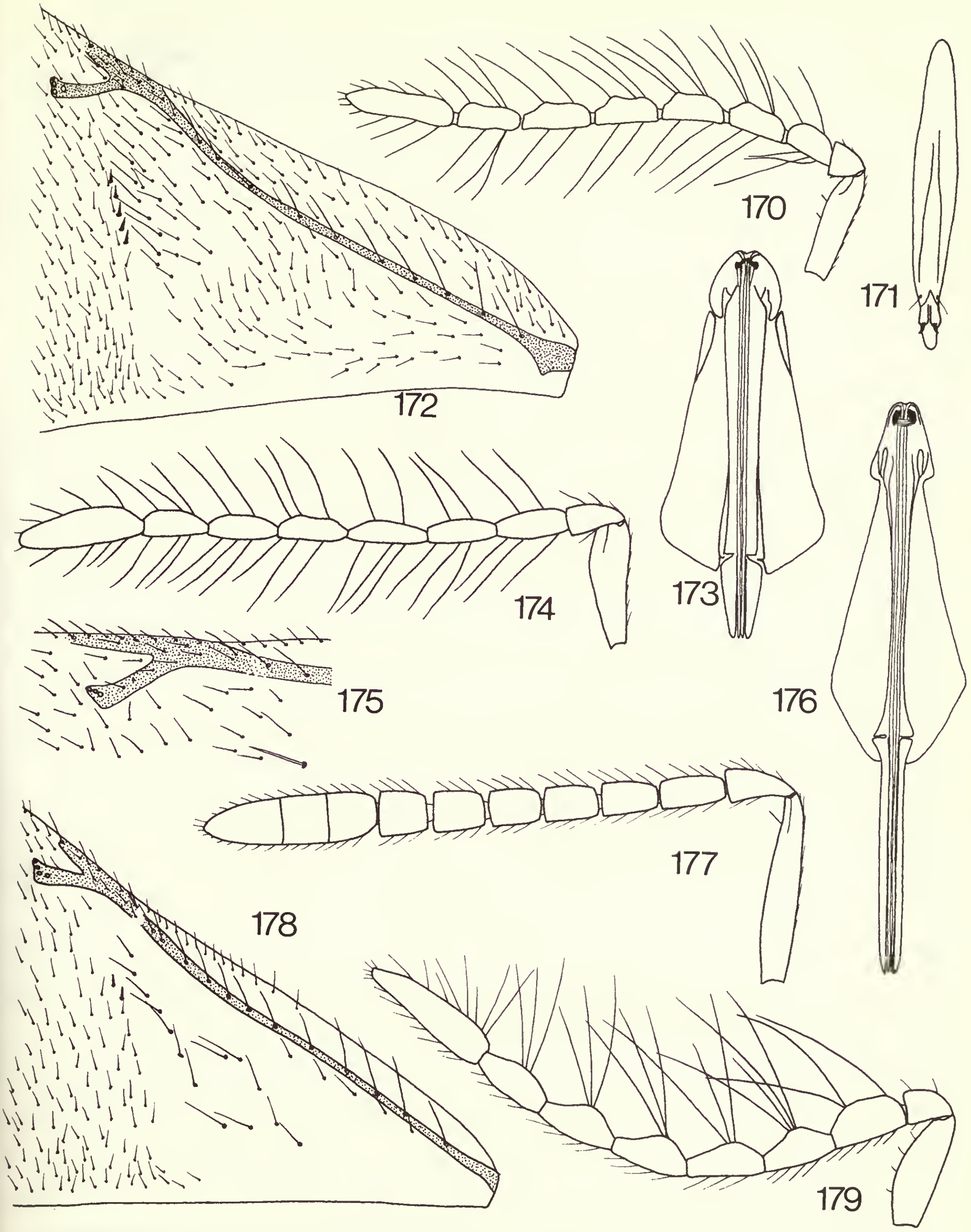
– First two funicle segments not contrasting as greatly with other segments as above, each usually slightly smaller than the third 23

23 (22) Maxillary palpi two-segmented, labial palpi one-segmented . . ***TIMBERLAKIA*** (p. 233)

– Maxillary palpi three- or four-segmented, labial palpi two-segmented 24

24 (23) Antenna more or less unicolorous, yellow or yellowish orange. Pronotum and mesoscutum usually concolorous . . . . . . ***ACEROPHAGUS*** (p. 169)

– Antenna with clava white or yellowish white and contrasting with dark brown funicle segments, or, if these are white then with dark brown scape. Pronotum often distinctly paler than mesoscutum . . . . . ***PSEUDAPHYCUS*** (p. 225)



Figs 170–179 170, 171, *Helmecephala* sp. ♂, (170) left antenna, outer aspect, (171) genitalia; 172, 173, *Helmecephala albisetosa* sp. n. ♀, (172) base of left forewing, upper surface, (173) genitalia; 174, 175, *Iceromyia flavifrons* sp. n. ♂, (174) left antenna, outer aspect, (175) left forewing venation; 176, *Iceromyia* sp. ♀, genitalia; 177–179, *Lirencyrtus primus* sp. n., (177) left antenna, outer aspect, ♀, (178) left forewing base, upper surface, ♀, (179) left antenna, outer aspect, ♂.

25 (8) Frontovertex with very conspicuous shiny-bottomed thimble-punctures. Forewing with stigmal vein arising before submarginal reaches wing margin (as in Fig. 86). Occipital margin sharp. Funicle segments at least as wide as pedicel, the first five longer than broad and with extremely short hairs. . . . ***LOCHITOENCYRTUS*** (p. 209)
– Combination of characters not as above 26

26 (25) Both mesoscutum and scutellum convex and with longitudinally strigose sculpture. Postmarginal vein shorter than stigmal (as in Fig. 163). Flagellum variable. Funicle seven-segmented with clava one- or two-segmented (Fig. 119) or funicle six-segmented with clava two- or three-segmented . . . . ***DESOBIUS*** (p. 192)
– If both mesoscutum and scutellum have longitudinally strigose sculpture then scutellum flat or postmarginal vein longer than stigmal (Fig. 130). Flagellum with funicle always six-segmented, clava usually entire*. 27

27 (26) Funicle not unicolorate, with basal segments dark and apical segments white. Frontovertex narrow, not more than twice as broad as anterior ocellus. Forewing darkened with a transverse hyaline band in apical third . . ***COMPERIA*** (p. 189)

– Combination of characters not as above 28

28 (27) Not all funicle segments longer than broad. 29
– All funicle segments longer than broad 56

29 (28) Funicle with at least one segment with setae at least one and a half times as long as its diameter 30
– Setae on funicle segments at most as long as diameter of funicle segments . . . 31

30 (29) Tarsi four-segmented. Scutellum without tubercles or pits . ***ARRHENOPHAGUS*** (p. 178)
– Tarsi five-segmented. Scutellum with tubercles or pits (easy to see on cleared, slide mounted material) (as in Figs 98, 99) . . . . ***FORCIPESTRICIS*** (p. 196)

31 (29) Mid-tibial spur expanded at apex and sack-like (as in Fig. 61). Funicle consisting of two anelliform segments and four segments which are longer than broad . . . . ***DESANTISELLA*** (p. 191)
– Mid-tibial spur normal, long and pointed at apex 32

32 (31) Wings shortened, not reaching apex of gaster. Body yellow. Notaular lines more or less complete . . . . ***ECHTHROPLEXIELLA*** (p. 194)
– Wings fully developed, at least reaching apex of gaster 33

33 (32) Postmarginal vein longer than stigmal (as in Fig. 130) 34
– Postmarginal vein not longer than stigmal 40

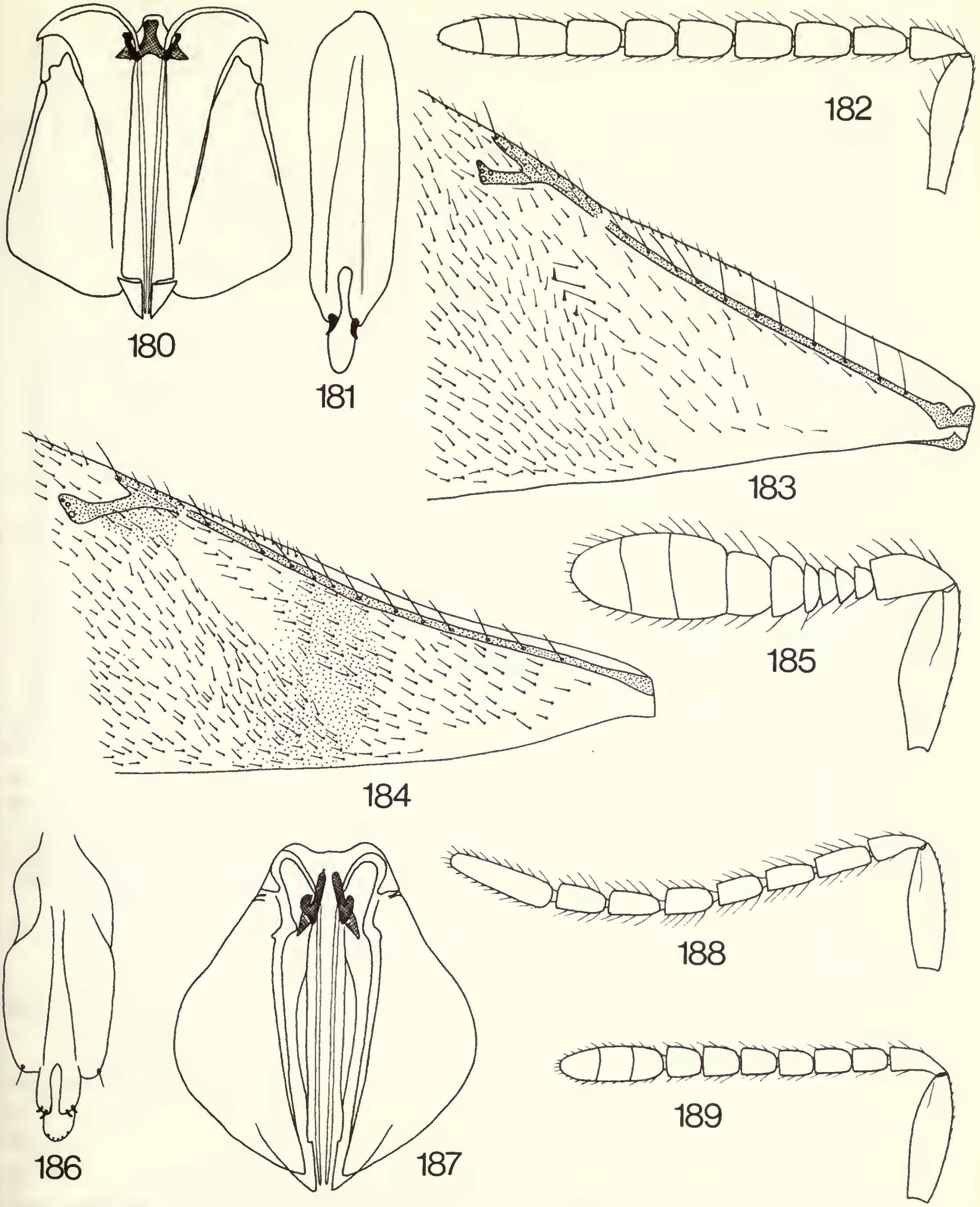
34 (33) First funicle segment at least slightly narrower than pedicel, at least some funicle segments as long as, or longer than broad . . . ***PARALEUROCERUS*** (p. 219)
– First funicle segment distinctly broader than pedicel, or, if not then all funicle segments transverse 35

35 (34) Frontovertex, above antennal scrobes, with coarser sculpture than below this point which is smooth and shiny, the area below the top of the antennal scrobes contrasting greatly in colour with the area above and also more shiny. Antennal torulus separated from mouth margin by distance equal to about its own length. Hairs on eyes generally short and inconspicuous 36
– Frontovertex and area below top of antennal scrobes of similar sculpture and colour. Antennal torulus often separated from mouth margin by much less than its own length. Setae on eyes usually long and very conspicuous. 37

36 (35) Sculpture of scutellum slightly coarser and more elongate (particularly in centre) than that on mesoscutum. Postero-lateral margins of mesoscutum not slightly raised and without smoother sculpture than rest of mesoscutum . ***ZAPLATYCERUS*** (p. 235)

---

* Note added while this paper was in press. *Tachinaephagus* Ashmead has a seven-segmented funicle and scutellum which is smooth and shiny.



Figs 180–189 180, 181, *Lirencyrtus primus* sp. n., (180) genitalia, ♀, (181) genitalia, ♂; 182, 183, *Lohiella flaviclava* (Howard), ♀, (182) left antenna, outer aspect, (183) base of left forewing, upper surface; 184, 185, *Mariola flava* sp. n., ♀, (184) left forewing base, upper surface, (185) left antenna, outer aspect; 186–189, *Mucrencyrtus insulanus* sp. n., (186) genitalia, ♂, (187) genitalia, ♀, (188) left antenna, outer aspect, ♂, (189) left antenna, outer aspect, ♀.

– Sculpture of scutellum more or less same as, or shallower than, on mesoscutum. Postero-lateral margins of mesoscutum slightly turned upwards and with slightly smoother sculpture (particularly on inner face) than rest of mesoscutum. . . ***CHRYSOPLATYCERUS*** (p. 185)

37 (35) Cerci in apical half of gaster . . . . ***AEPTENCYRTUS*** (p. 171)
– Cerci in basal half of gaster 38

38 (37) Posterior ocellus nearly touching margin of eye, separated by at most the diameter of a facet, also separated from occipital margin by distance slightly greater than from eye. Frontovertex usually with distinct thimble-punctured sculpture . ***AENASIUS*** (p. 170)
– Posterior ocellus separated from eye margin by distance equal to diameter of at least two facets and often much closer to occipital margin than to eye. Frontovertex never with thimble-punctured sculpture 39

39 (38) Posterior ocellus separated from occipital margin by about diameter of a facet or nearer occipital margin than eye margin. POL: OOL about 8 : 1 . ***ZARHOPALUS*** (p. 235)
– Posterior ocellus separated from occipital margin by about diameter of two facets and about equidistant from occipital and eye margins. POL : OOL about 6 : 1 . . ***COELASPIDIA*** (p. 188)

40 (33) Base of scape with distinct spine (Fig. 120). Vertex at anterior ocellus abruptly raised much above dorsal level of eyes . . . . . ***COELOPENCYRTUS*** (p. 189)
– Base of scape without spine. Vertex at anterior ocellus hardly raised above dorsal level of eyes 41

41 (40) Apical two-thirds of submarginal vein with a triangular expansion (as in Fig. 20) (mandibles bidentate, notaular lines indicated at anterior margin of mesoscutum) . ***PAURIDIA*** (p. 221)
– Submarginal vein without triangular expansion, or, if it is slightly thickened apically then notaular lines more or less complete or mandibles tridentate 42

42 (41)* Clava two-segmented, scutellum more or less flat, smooth and shiny . . . . ***ZETETICONTUS*** (p. 236)
– Clava entire, scutellum with clear sculpture and usually distinctly convex . . . 43

43 (42) Mandibles unidentate or bidentate 44
– Mandibles tridentate or with one or two teeth and a truncation 46

44 (43) Notaular lines reaching one-third across mesoscutum. Frontovertex at narrowest point at most one-third length of head width. Head and thorax mostly orange, clava and apical funicle segment white . . . . . . ***CIRRHENCYRTUS*** (p. 187)
– Notaular lines completely absent. Frontovertex at narrowest point at least about half length of head width. Head and thorax dark and metallic. Clava and funicle brown 45

45 (44) Frontovertex and eyes with conspicuous long setae, frontovertex at narrowest point about half length of head width. Propodeum medially at least one-sixth as long as scutellum (Fig. 121) . . . . ***RHYTIDOTHORAX*** (p. 226)
– Eyes naked and frontovertex without conspicuous setae and very wide, at narrowest point well over three-fifths as wide as head. Propodeum medially at most one-eighth as long as scutellum . . . . ***NEODUSMETIA*** (p. 216)

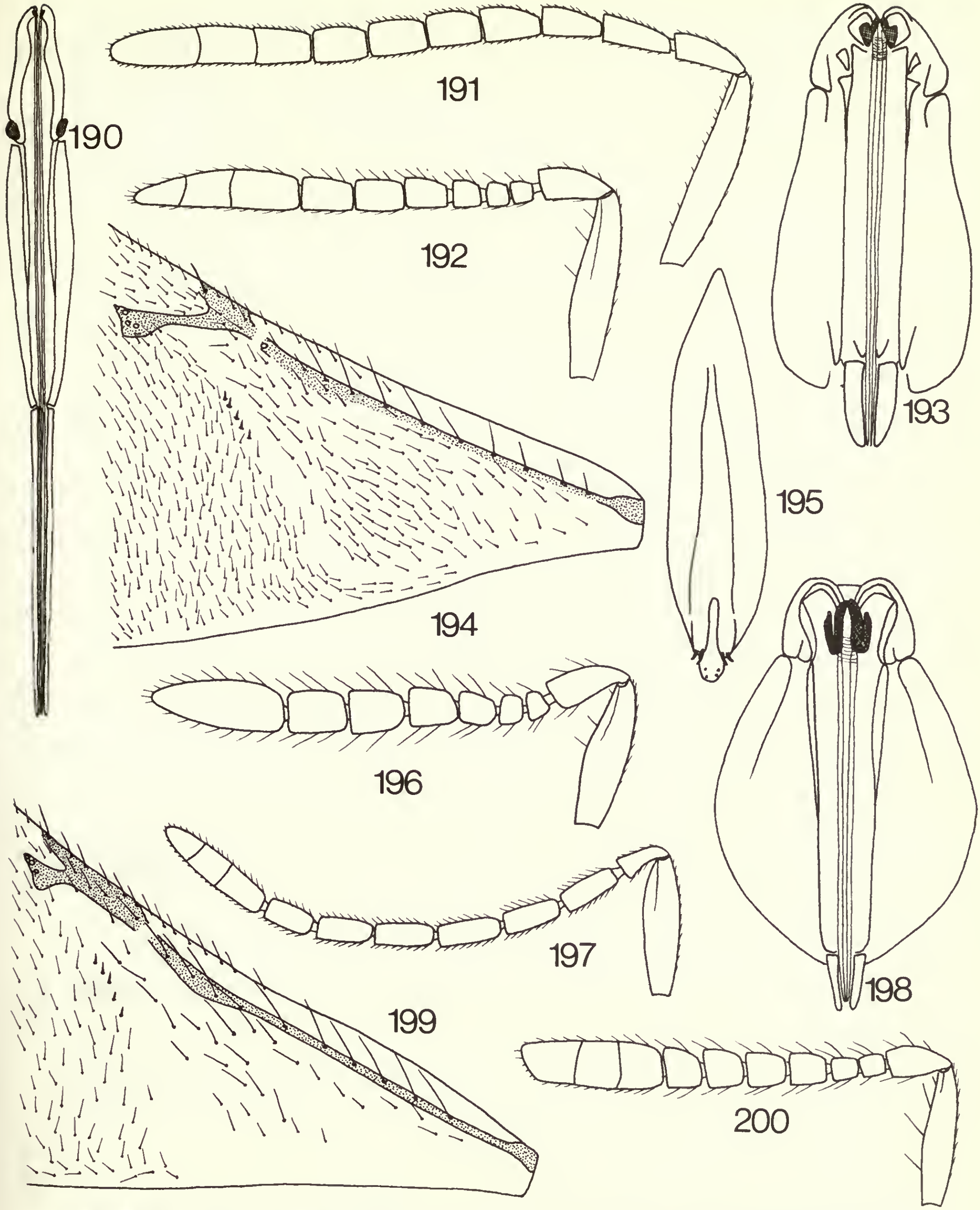
46 (43) Clava obliquely truncate (Figs 122, 123) 47
– Clava apically rounded 50

47 (46) Notaular lines present and extending at least half way across mesoscutum 48
– Notaular lines completely absent or indicated at anterior margin of mesoscutum only. 49

48 (47) Marginal vein slightly longer than broad, postmarginal distinct (Fig. 125). Mesoscutum with notaular lines more or less reaching posterior margin (as in Fig. 1). . . ***HOMALOTYLUS*** (p. 203)

---

* Note added while this paper was in press. *Asitus* Erdös runs here but differs from other included genera in having an extremely flattened leaf-like body, a longitudinally divided pronotum and the forewing with the marginal fringe at least one-fifth as long as maximum width of wing.



Figs 190–200 190, 191, *Neapsilophrys flavipes* sp. n. ♀, (190) genitalia, (191) left antenna, outer aspect; 192–196, *Papaka confusor* sp. n., (192) left antenna, outer aspect, ♀, (193) genitalia, ♀, (194) left forewing base, upper surface, ♀, (195) genitalia, ♂, (196) left antenna, outer aspect, ♂; 197, 198, *Paramucrona brasiliensis* sp. n. ♀, (197) left antenna, outer aspect, (198) genitalia; 199, 200, *Protyndarichoides nigriceps* sp. n. ♀, (199) left forewing base, upper surface, (200) left antenna, outer aspect.

– Marginal vein punctiform or absent, postmarginal very short or absent (Fig. 124). Notaular lines at most only reaching half way across mesoscutum . . . . . ***ISODROMUS*** (p. 206)

49 (47) Head and thorax dark, metallic.
Scutellum with purple reflections contrasting with the green mesoscutum . . ***LITOMASTIX*** (p. 208)

– Head and thorax yellow or orange yellow, not metallic . . ***BRETHESIELLA*** (p. 183)

50 (46) Mesoscutum metallic green, scutellum convex and metallic green with strong purple reflections 51

– Mesoscutum and scutellum not as above, or, if metallic then scutellum flat . . 52

51 (50) Marginal vein punctiform, postmarginal absent (Fig. 126) ***PENTALITOMASTIX*** (p. 222)

– Marginal vein at least slightly longer than broad, postmarginal distinct, about half as long as stigmal . . . . ***LITOMASTIX*** (p. 208)

52 (50) Scutellum triangular in dorsal view, the sides more or less straight and with apex acute (Fig. 127), sculpture elongate and contrasting with shallower more polygonal sculpture of mesoscutum. Clava (in slide mounted material) with indications of being three-segmented. Mandibles with three acute teeth . . ***BAEOENCYRTUS*** (p. 180)

– Scutellum shield-shaped in dorsal view with sides and apex more or less rounded and occasionally with deep elongate sculpture. Clava without indications of segmentation. If scutellum is almost triangular in dorsal view then mandibles have upper tooth rudimentary. 53

53 (52) Thorax orange. Scutellum and posterior margin of pronotum with a few contrasting dark setae. Mandibles with third (upper) tooth rudimentary . . . . . ***CIRRHENCYRTUS*** (p. 187)

– Thorax dark brown, or, if orange then without contrasting dark setae. Legs often with dark areas. Mandibles with three acute teeth or sometimes with upper tooth rudimentary (*Papaka*, as in Fig. 102) 54

54 (53) Frontovertex narrow, at narrowest point not more than about one-seventh of head width. Speculum not interrupted (Fig. 154) . . . . ***CICOENCYRTUS*** (p. 186)

– Frontovertex wider, at narrowest point at least about one-fifth of head width. Speculum sometimes interrupted by one to three lines of setae on dorsal surface of wing (Fig. 129) 55

55 (54) Mandibles with three acute teeth . . . . ***METAPHYCUS*** (p. 212)

– Mandibles with upper tooth rudimentary and not acute (as in Fig. 102) ***PAPAKA*** (p. 217)

56 (28) Head dark with several pale markings around antennal scrobes, eyes margined white, interantennal prominence with an inverted dark 'V' originating at the antennal toruli (as in Fig. 93) (setae on funicle about as long as the diameter of the funicle segments) ***TACHARDIOBIUS*** (p. 231)

– Not as above 57

57 (56) Head with at least three membranous lines, two longitudinal ones from about level with anterior ocellus along inner margins of the eyes and outer margins of scrobes to near antennal toruli, these being joined by a third transverse line along the top of the scrobes (Fig. 128, also cf. Fig. 95).
Body flattened, mandibles tridentate 58

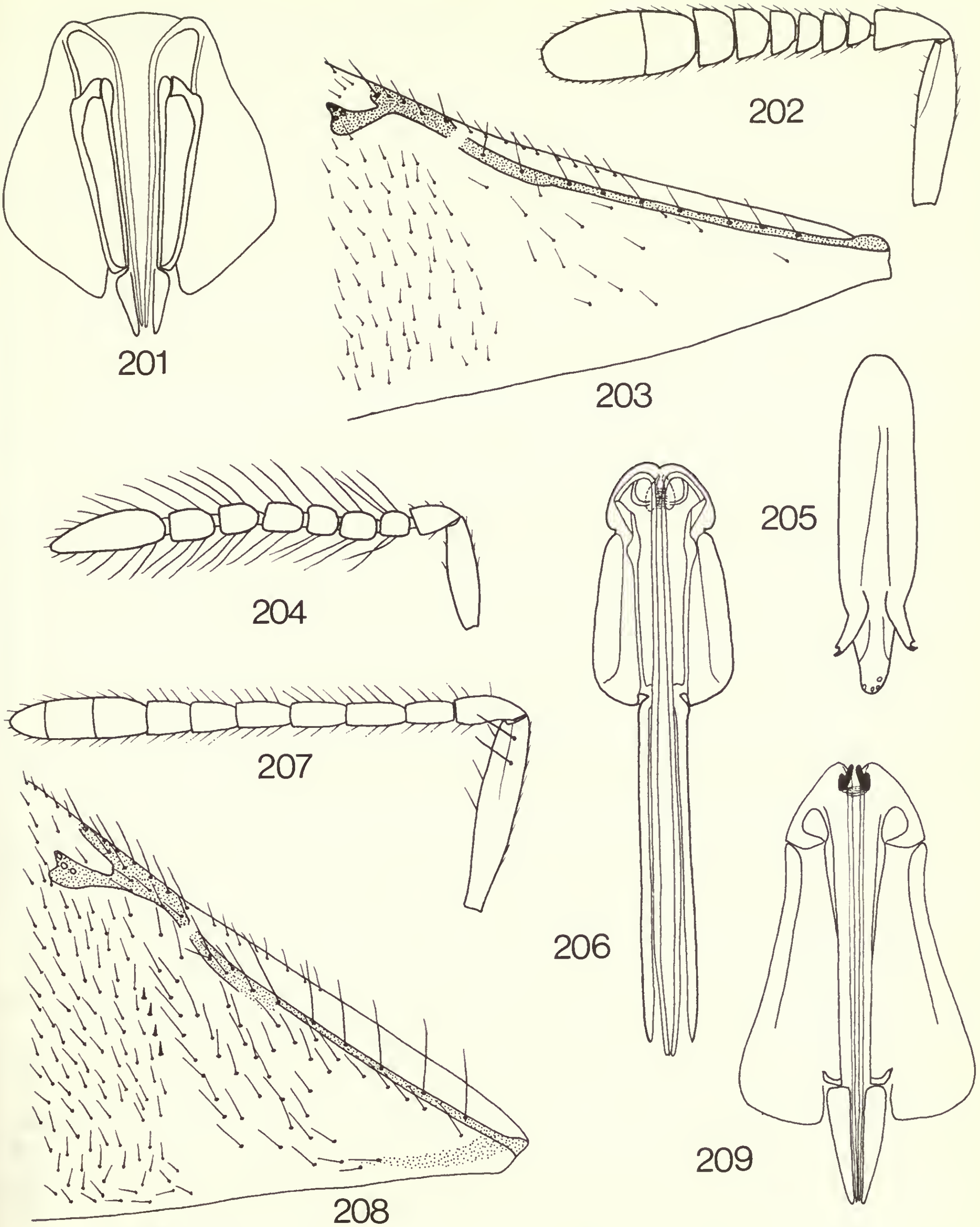
– Head without such membranous lines. 59

58 (57) Setae on funicle not longer than diameter of funicle segments. Labial palpi one-segmented . . . . ***SZELENYIOLA*** (p. 231)

– Setae on funicle at least about twice as long as diameter of funicle segments. Labial palpi three-segmented. . . . . ***AVETIANELLA*** (p. 179)

59 (57) Funicle segments with longest setae at most equal to diameter of corresponding segment 60

– Funicle segments with at least setae longer (usually at least one and a quarter times as long) than diameter of corresponding segment 85



Figs 201–209 201, *Protyndarichoides nigriceps* sp. n. ♀, genitalia; 202–205, *Shenahetia masneri* sp. n., (202) left antenna, outer aspect, ♀, (203) left forewing base, upper surface, ♀, (204) left antenna, outer aspect, ♂, (205) genitalia, ♂; 206, *Shenahetia* sp. ♀, genitalia; 207, *Simmondsiella flaviptera* sp. n. ♀, left antenna, outer aspect; 208, 209, *Tetarticlava yoshimotoi* sp. n. ♀, (208) left forewing base, upper surface, (209) genitalia.

60 (59) Hind tibia distinctly bilaterally flattened, at most four times as long as broad (as in Fig. 64) . . . . ***CARABUNIA*** (p. 184)

– Hind tibia not flattened, or, if slightly flattened then more than five times as long as broad 61

61 (60) Postmarginal vein at least slightly longer than stigmal (Figs 133, 135, 136). . . . 62

– Postmarginal vein not longer than stigmal 68

62 (61) Scutellum with a distinct apical tuft of setae. Mandibles without teeth . . . . ***ENCYRTUS*** (p. 195)

– Scutellum without apical tuft of setae (occasionally a few longer setae at apex). Mandibles with at least one distinct tooth 63

63 (62) At least anterior three-quarters of mesoscutum with dark setae and longitudinally striate sculpture, posterior one-half to one-third of mesoscutum clothed in pale setae 64

– Mesoscutum not with elongate sculpture, or if sculpture elongate then setae are entirely dark throughout 65

64 (63) Frontovertex, particularly between ocelli, with coarse, regular, punctate sculpture. Sculpture in centre of mesonotum not, or hardly, longitudinally striate in contrast to that at sides which is very elongate . . . . . . ***DIVERSINERVUS*** (p. 193)

– Frontovertex with irregular, shallow, reticulate sculpture. Sculpture in centre of mesoscutum longitudinally striate, although not as strongly as that at sides . . **genus A** (p. 169)

65 (63) Stigmal vein very short, not as long as marginal (Fig. 130) . . ***AGENIASPIS*** (p. 171)

– Stigmal vein very long and curved towards anterior margin of forewing or longer than marginal (Figs 133, 135, also cf. Fig. 53). 66

66 (65) Legs completely yellow. Forewings hyaline. Mandibles tridentate . ***MICROTERYS*** (p. 213)

– Legs not completely yellow. Forewings often partially infuscate. Mandibles not tridentate 67

67 (66) Marginal vein rather short, hardly twice as long as broad, costal cell dorsally with only a few setae at apex (Fig. 135). Posterior ocellus separated from eye margin by at least about twice its own diameter. Mandibles with one tooth and a broad truncation . ***PRIONOMASTIX*** (p. 223)

– Marginal vein at least about six times as long as broad, costal cell dorsally with a complete line of setae extending from base to apex along wing margin (as in Fig. 53). Posterior ocellus nearly touching eye margin. Mandibles bidentate . . . . . ***ERICYDNUS*** (p. 195)

68 (61) Speculum interrupted in lower half by at least one line of setae on dorsal surface of wing (Fig. 129). Notaular lines indicated anteriorly or complete, clava never apically truncate.

Marginal vein punctiform. Thorax never shiny, if dark then matt. Mandibles tridentate . . . . ***METAPHYCUS*** (p. 212)

– Speculum not interrupted. Notaular lines absent except in *Homalotylus* where they are more or less complete (as in Fig. 1) and the clava is apically obliquely truncate (as in Fig. 123). 69

69 (68) Notaular lines more or less complete (as in Fig. 1). Clava apically obliquely truncate (as in Fig. 123) . . . . ***HOMALOTYLUS*** (p. 203)

– Notaular lines absent. Clava apically rounded 70

70 (69) Clava two-segmented 71

– Clava solid 73

71 (70) Mandibles with one tooth and a broad truncation (as in Fig. 91). Marginal vein punctiform. Frontovertex broad, much broader than length of eye (eyes small). Length of hind tarsus rather longer than corresponding hind tibia (Fig. 132) . . ***HUNTERELLUS*** (p. 204)

– Mandibles tridentate or with two teeth and a truncation. Marginal vein longer than broad. Frontovertex narrower than the length of an eye. Length of hind tarsus shorter than length of corresponding hind tibia 72

72 (71) Scutellum smooth and shiny . . . . ***ZETETICONTUS*** (p. 236)
– Scutellum with distinct sculpture.
Clava entire but appearing two-segmented in dry mounted specimens . . . 73

73 (70, 72) Mandibles without teeth. Apex of scutellum usually with a tuft of long setae . . ***ENCYRTUS*** (p. 195)
– Mandibles with three acute teeth or with one or two teeth and a truncation. Apex of scutellum without tuft of setae 74

74 (73)* Mandibles with three acute teeth 75
– Mandibles with one or two teeth and a truncation 81

75 (74) Marginal vein punctiform 76
– Marginal vein at least twice as long as broad 78

76 (75) Thorax and head orange . . . . ***MUCRENCYRTUS*** (p. 213)
– Thorax and head dark and metallic 77

77 (76) Dorsum of scutellum with deep longitudinally striate sculpture, contrasting with the much more shallow, polygonal sculpture of mesoscutum. Scutellum not very shiny (except at sides) and more or less dark purplish brown contrasting with the shiny green mesoscutum. Spur of mid tibia shorter than corresponding basitarsus . . ***PARALITOMASTIX*** (p. 219)
– Dorsum of scutellum not with longitudinally striate sculpture and often quite shiny, occasionally purplish. Spur of mid tibia usually about as long or longer than corresponding basitarsus . . . . ***COPIDOSOMA*** (p. 189)

78 (75) Scutellum very convex with deep, rough striate sculpture. Apex of scutellum with very short, smooth, thin, leaf-like extension (as in Fig. 94) . . ***AMAURILYMA*** (p. 171)
– If scutellum convex with deep striate sculpture then apex is without leaf-like extension 79

79 (78) Both mesoscutum and scutellum with very fine longitudinally striate-reticulate sculpture, anterior two-thirds of mesoscutum with dark setae, posterior one-third with pale setae . . . . **genus A** (p. 169)
– Never both mesoscutum and scutellum with sculpture as above, mesoscutum occasionally with pale setae but these always evenly distributed 80

80 (79) Axillae distinctly raised above level of scutellum with posterior margin step-like, almost vertical and mirror shiny, mesoscutum often with conspicuous white setae . . ***APSILOPHRYS*** (p. 176)
– Axillae hardly raised above level of scutellum and with posterior margin distinctly sculptured, mirror never shiny. Setae on mesoscutum dark 81

81 (74, 80) Marginal vein punctiform or only slightly longer than broad, usually as long or longer than stigmal, postmarginal generally not distinct and therefore shorter than marginal (as in Fig. 76). Posterior margin of mesoscutum produced backwards in middle third so that axillae appear to be widely separated (as in Fig. 77). Parasites of eggs of Lepidoptera, Hemiptera, etc. . . . . ***OOENCYRTUS*** (p. 217)
– Marginal vein usually at least twice as long as broad, stigmal and postmarginal veins relatively long, or, if marginal punctiform then stigmal vein distinctly longer than marginal. Posterior margin of mesoscutum gently curved or with either side straight and centrally slightly angled so that axillae appear to meet or nearly meet centrally and are not greatly separated by posterior margin of mesoscutum, or, if as above then marginal vein is distinctly at least twice as long as broad 82

82 (81) Marginal vein punctiform and shorter than stigmal (as in Fig. 75). Funicle segments often flattened and broadened, much wider than pedicel. Parasites of Psyllid nymphs ***PSYLLAEPHAGUS*** (p. 226)
– Marginal vein at least twice as long as broad and as long or longer than stigmal. Funicle segments cylindrical 83

---

* Note added while this paper was in press. *Boucekiella* Hoffer and *Platencyrtus* Ferrière run here but differ from other genera in having an extremely flattened leaf-like body. *Boucekiella* has the submarginal vein with a triangular expansion which is absent in *Platencyrtus*.

83 (82) Tegulae with at least base yellow or distinctly paler than apex (rarely completely dark). Scutellum never with sculpture conspicuously deeper than that on mesoscutum . ***MICROTERYS*** (p. 213)

– Tegulae completely black or dark brown. Scutellum often with sculpture much deeper than that on mesoscutum 84

84 (83) At least outer face of scape distinctly paler (usually yellow) than flagellum (usually brown). Parasites of Coccoidea . . . . ***TRICHOMASTHUS*** (p. 234)

– Scape always as dark or darker than flagellum. Parasites of Syrphidae . . . ***SYRPHOPHAGUS*** (p. 230)

85 (59) Wings shortened, not reaching apex of gaster 86

– Wings reaching apex of gaster 87

86 (85) Body flattened. Mandibles bidentate. Wing rudiments hyaline . . . ***RHOPUS*** (p. 226)

– Body not flattened. Mandibles tridentate, the third (upper) tooth often truncate. Wing rudiments sometimes darkened . . . . ***CHEILONEURUS*** (p. 184)

87 (85) Mandibles without teeth. Apex of scutellum usually with a tuft of long setae. Clava entire. Stigmal vein longer than marginal, postmarginal as long or longer than stigmal ***ENCYRTUS*** (p. 195)

– Mandibles with from one to three acute teeth. Apex of scutellum usually without a tuft of setae, if tuft present then stigmal vein not longer than marginal and postmarginal shorter than stigmal (*Gahaniella* may have mandibles without teeth but clava two-segmented) 88

88 (87) Mandibles unidentate or bidentate 89

– Mandibles tridentate, with one or two teeth and a truncation, or without teeth . . 100

89 (88) Epipygium covering less than half dorsal surface of gaster. Neither sixth funicle segment nor clava with perpendicular sensilla. Speculum never interrupted 90

– Epipygium covering at least about two-thirds dorsal surface of gaster (Fig. 134), sixth funicle segment or clava usually with perpendicular sensilla (Fig. 131). Speculum usually interrupted in lower half by at least one line of setae on dorsal surface of wing (as in Figs 70, 71) (*Rhopus* may have shortened wings) 94

90 (89) Cerci in apical half of gaster . . . . ***GONZALEZIA*** (p. 197)

– Cerci in basal half of gaster 91

91 (90) Scutellum with tubercles or pits (as in Figs 98, 99) (these are best seen in cleared slide mounted material) . . . . ***FORCIPESTRICIS*** (p. 196)

– Scutellum without tubercles or pits 92

92 (91) Marginal vein punctiform or only very slightly longer than broad and postmarginal absent. Area between stigmal vein and anterior margin of wing completely naked. Propodeum short, medially at most one-eighth as long as scutellum . . . . ***BRACHYPLATYCERUS*** (p. 183), ***HEMAENASIUS*** (p. 202)

– Marginal vein distinctly longer than broad, postmarginal and stigmal veins relatively long. Area between stigmal vein and wing margin with several setae. Propodeum medially at least one-sixth as long as scutellum 93

93 (92) Centre of propodeum completely smooth or with only very light sculpture and apex of scutellum without distinct carina along its edge. Eyes with rather short inconspicuous setae. Mandibles rather broad with two teeth of almost equal length. ***ASEIRBA*** (p. 179)

– Centre of propodeum with distinct sculpture and apex of scutellum with carina along its margin (Fig. 121) (often indistinct or absent in those species with a smooth scutellum). Eyes usually with conspicuous setae. Mandibles narrow with teeth of unequal length, the upper being long and the lower very short or absent . . ***RHYTIDOTHORAX*** (p. 226)

94 (89) Body dorso-ventrally flattened (wings sometimes shortened) . . . . ***RHOPUS*** (p. 226)

– Body not flattened (wings always fully developed) 95

95 (94) Frontovertex and mesoscutum with sculpture punctate, giving it a silky or granulate appearance 96

– Frontovertex and mesoscutum with shallow reticulate sculpture, often quite shiny . 97

96 (95) Postmarginal vein longer than stigmal. Frontovertex with regular, raised, polygonal sculpture . . . . ***GYRANUSOIDEA*** (p. 199)

– Postmarginal vein short, much shorter than stigmal. Frontovertex with rather fine raised, irregular, sculpture . . . . ***ANAGYRUS*** (p. 173)

97 (95) Postmarginal vein at least one and a half times as long as stigmal. Longest cilia on hind wings at least half as long as maximum width of wing. Forewing usually with at least indications of two or three dark fasciae . . . . . ***LEPTOMASTIDEA*** (p. 206)

– Postmarginal vein at most one and one third times as long as radial. Longest cilia on hind wings usually much less than half as long as maximum width of wing. Forewing completely hyaline 96

98 (97) Sculpture of scutellum deeper and coarser than on mesoscutum so that scutellum is noticeably less shiny than mesoscutum . . . . . ***APOANAGYRUS*** (p. 176)

– Sculpture on scutellum not distinctly deeper and coarser than on mesoscutum so that scutellum is about as shiny as mesoscutum 99

99 (98) Postmarginal vein slightly shorter than stigmal . . . ***EXTROMATOPSIS*** (p. 194)

– Postmarginal vein longer than stigmal . . . . . . ***LEPTOMASTIX*** (p. 206)

100 (88) Postmarginal vein longer than stigmal (Figs 130, 133, 175) 101

– Postmarginal vein not longer than stigmal 106

101 (100) Head with punctate sculpture and dorsum of thorax with very fine semi-striate sculpture which gives it a silky appearance. Speculum interrupted in its posterior half by a line of setae on dorsal surface of wing; first funicle segment hardly longer than pedicel, funicle with setae not much longer than diameter of corresponding segment. Head usually blue, thorax dorsally dark purplish brown . . . ***AGENIASPIS*** (p. 171)

– Sculpture and coloration of head and thorax not as above. Speculum not interrupted. First funicle segment usually at least about twice as long as pedicel, funicle with much longer setae than above (except *Microterys*) 102

102 (101) Sculpture on scutellum elongate and arranged in a whorl-like pattern, distinctly deeper than that on mesoscutum, apex of scutellum sometimes with a tuft of setae. Tegulae brown 103

– Sculpture on scutellum not elongate or arranged in whorls, if much deeper than that on mesoscutum, then tegulae are yellow, apex of scutellum never with a tuft of setae . 104

103 (102) Frontovertex, particularly between ocelli and below anterior ocellus, with regular punctate sculpture. Posterior one-third of mesoscutum very slightly concave and often with pale setae in contrast to the anterior two-thirds which is convex and usually with dark setae . . . . ***DIVERSINERVUS*** (p. 193)

– Frontovertex with irregular, slightly transversely elongate sculpture. Mesoscutum regularly convex and without pale setae . . . . . ***ICEROMYIA*** (p. 204)

104 (102) Propodeum long, centrally at least one-sixth as long as scutellum and with sculpture centrally (as in Fig. 60). Apex of scutellum often produced as translucent flange (if scutellum convex then flange is absent or very indistinct). Eyes often very hairy. Frontovertex and dorsum of thorax usually with thimble-punctured sculpture (often sparse). Setae on dorsal side of funicle usually about twice as long as those ventrally. Clava apparently two-segmented . . . . . ***HEMENCYRTUS*** (p. 202)

– Propodeum centrally at most one-seventh as long as scutellum and smooth. Apex of scutellum never produced as a flange. Eyes naked or with short setae. Frontovertex and thorax never with thimble-punctured sculpture. Setae on funicle the same length dorsally as ventrally. Clava entire 105

105 (104) Antennal torulus separated from mouth margin by much more than its own length. Head and thorax usually metallic green. Mandibles often with third upper tooth truncate. Tegulae often yellow or orange . . . . . ***MICROTERYS*** (p. 213)

– Antennal torulus separated from mouth margin by less than its own length. Head and thorax brown with some green, blue and purple reflections. Mandibles with three acute teeth. Tegulae dark brown . . . . . ***COCCIDOCTONUS*** (p. 188)

106 (100) Clava two-segmented 107

– Clava entire 109

107 (106) Scutellum smooth and shiny, except occasionally the basal two-thirds which may have thimble-punctured sculpture but apical one-third always smooth and shiny . . ***ZETETICONTUS*** (p. 236)

– Scutellum with distinct sculpture, apical one-third never smooth or shiny . . . 108

108 (107) Propodeum long, centrally at least one-sixth as long as scutellum and with distinct sculpture centrally (as in Fig. 60). Apex of scutellum often produced as a translucent flange. Eyes often very hairy. Frontovertex and dorsum of thorax usually with thimble-punctured sculpture (often sparse). Mandibles tridentate . . . . ***HEMENCYRTUS*** (p. 202)

– Propodeum centrally at most one-seventh as long as scutellum and without sculpture. Apex of scutellum without flange. Eyes naked or with very short setae. Frontovertex and thorax usually with fine punctate sculpture, never thimble-punctured. Mandibles without teeth or with one tooth and a truncation . . . ***GAHANIELLA*** (p. 197)

109 (106) Scutellum with tubercles or pits (as in Figs 98, 99) (best seen in cleared slide mounts). Frontovertex usually smooth and shiny and with setae. Eyes hairy . . . ***FORCIPESTRICIS*** (p. 196)

– Scutellum without tubercles or pits 110

110 (109) At least head and usually dorsum of thorax with thimble-punctured sculpture. If punctures indistinct then scutellum is flat and apically produced as a translucent flange 111

– Head and dorsum of thorax without thimble-punctured sculpture and apex of scutellum not produced as a flange. 113

111 (110) Marginal vein punctiform (as in Fig. 87). Thimble punctures on head and thorax deep and distinct. Scutellum convex without any indication of apical translucent flange . ***BOTHRIOTHORAX*** (p. 182)

– Marginal vein much longer than broad. Thimble-punctures on head and thorax often indistinct. Scutellum flat with distinct apical translucent flange, or convex with flange very narrow and indistinct or absent 112

112 (111) Frontovertex with shiny-bottomed piliferous punctures. Mandibles with two acute teeth and a truncation. Apex of scutellum without translucent flange . . . . ***HELMECEPHALA*** (p. 200)

– Punctures on frontovertex not shiny-bottomed. Mandibles with three acute teeth. Apex of scutellum often produced as translucent flange (as in Fig. 60) . . . . ***HEMENCYRTUS*** (p. 202)

113 (110) Funicle without whorls of long setae. Setae less than twice as along the diameter of corresponding segment 114

– Funicle segments with whorls of long setae or setae which are at least twice as long as diameter of corresponding segment. 124

114 (113) Marginal vein punctiform hardly longer than broad, postmarginal very short or absent (as in Fig. 76) . . . . ***OOENCYRTUS*** (p. 217)

– Marginal vein at least about twice as long as broad, postmarginal distinct, occasionally nearly as long as stigmal. 115

115 (114) Forewing darkened. Apex of scutellum with tuft of longer setae (sometimes indistinct or lost) . . . . ***CHEILONEURUS*** (p. 184)

– Forewing hyaline, or, if darkened, then with a barely discernible longitudinal wedge-shaped mark arising at apex (similar to Fig. 57). Apex of scutellum without tuft of setae 116

116 (115) Submarginal vein of forewing with a triangular expansion in its apical one-third (Fig. 138) (sometimes indistinct but always indicated by a conspicuous, long, erect seta). Forewing often with an indistinct longitudinal wedge-shaped fuscous streak arising at apex (similar to Fig. 57) . . . . ***PARECHTHRODRYINUS*** (p. 221)

– Submarginal vein of forewing without a triangular expansion, forewing without dark streak 117

117 (116) Tegulae with at least base yellow or paler than apex (rarely completely dark). Scutellum never with sculpture conspicuously deeper than mesoscutum . ***MICROTERYS*** (p. 213)

– Tegulae completely black or dark brown. Scutellum often with conspicuously deeper sculpture than mesoscutum 118

118 (117) Axillae with posterior face long and shiny. Propodeum centrally about one-sixth length of scutellum and with distinct sculpture medially (Fig. 140). Mesoscutum metallic green with purplish reflections anteriorly and covered with translucent hairs. Scutellum at base with deep, rough, irregular sculpture and with apical one-third highly polished (Fig. 140) . . . . ***HELEGONATOPUS*** (p. 200)

– Axillae more or less level with scutellum, not with posterior face long and shiny. Propodeum shorter and smooth centrally. Mesoscutum not as above. Scutellum occasionally rough at base and shiny at apex (some *Trichomasthus* and *Echthrodryinus*) but usually with similar sculpture throughout. 119

119 (118) Outer face of scape usually much paler (normally yellow) than flagellum (normally brown). Parasites of Coccoidea . . . . . . ***TRICHOMASTHUS*** (p. 234)

– Scape always about as dark or darker than flagellum. Not parasites of Coccoidea . 120

120 (119) Axillae not touching apically, always separated by posterior margin of mesoscutum . 121

– Axillae more or less touching apically. 123

121 (120) Scutellum abruptly convex at sides and at apex, dorsally almost flat, never with punctate sculpture, usually with uniform sculpture. Scutellum (without axillae) at least slightly longer than broad . . . . ***SYRPHOPHAGUS*** (p. 230)

– Scutellum uniformly convex, or flat dorsally, often with deep punctate sculpture with apical third of half smooth and shiny. Scutellum (without axillae) at most as long as broad 122

122 (121) Postmarginal vein long and distinct, half to nearly as long as stigmal. . . . . ***ECHTHRODRYINUS*** (p. 193)

– Postmarginal vein very short or absent (as in Fig. 76) . . . ***OOENCYRTUS*** (p. 217)

123 (120) Body usually not longer than 1 mm. Parasites of Aphidoidea ***APHIDENCYRTUS*** (p. 175)

– Body usually longer than 1 mm. Parasites of Syrphidae . ***SYRPHOPHAGUS*** (p. 230)

124 (113) Scutellum very convex and, at base, with several distinct longitudinal ridges running backwards from axillae (as in Fig. 74). Setae on dorsal side of funicle several times longer than those ventrally (Fig. 179) . . . . . . ***LIRENCYRTUS*** (p. 207)

– Scutellum occasionally very convex but never with longitudinal ridges at base. Setae on funicle usually about the same length dorsally as ventrally 125

125 (124)* Propodeum centrally at least one-fifth as long as scutellum and with at least one longitudinal carina. Submarginal vein with triangular expansion in its apical one-third (Fig. 138) (often indistinct), forewing occasionally with fuscous wedge-shaped streak from apex to near centre (similar to Fig. 57). ***PARECHTHRODRYINUS*** (p. 221)

– Propodeum shorter than one-sixth length of scutellum or, if longer then there are no distinct carinae. Submarginal vein usually without a triangular expansion, forewing never with fuscous wedge-shaped streak 126

126 (125) Mandibles with three acute teeth 127

– Mandibles with one or two teeth and a truncation 137

127 (126) First funicle segment at most as long as pedicel 128

– First funicle segment at least one and a half times as long as pedicel 131

128 (127) Scutellum flat and polished. Body slightly dorso-ventrally flattened 129

– Either scutellum distinctly convex or flat with distinct sculpture. Body robust . . 130

129 (128) Stigmal vein as long as marginal and with stigma hardly wider than vein (Fig. 139). Head with strong sculpture which is distinct on genae . . ***TANYENCYRTUS*** (p. 231)

---

* Note added while this paper was in press. *Cerapterocerus* Westwood runs here but the submarginal vein of the forewing has a distinct subapical triangular expansion; it differs from *Parechthrodryinus* in having hyaline forewings and the scutellum with a thin apical flange which overhangs the propodeum centrally for over half its median length (*Parechthrodryinus* has no distinct apical flange on the scutellum).

– Stigmal vein shorter than marginal and with stigma enlarged, at least two and a half times as wide as stigmal vein at base (Fig. 137). Head with very weak sculpture so that genae are very smooth and shiny . . . . ***SHENAHETIA*** (p. 227)

130 (128) Scape at least three and a half times as long as broad . ***MERCETENCYRTUS*** (p. 211)
– Scape at most three times as long as broad . . . . [***COCCIDENCYRTUS***] (p. 188)

131 (127) Forewing darkened . . . . ***CHEILONEURUS*** (p. 184)
– Forewing hyaline 132

132 (131) Head triangular in side view, the junction of the frontovertex and face forming an acute angle. Head orange, contrasting with dark brown thorax . . ***ANICETUS*** (p. 174)
– Head not triangular in side view, more or less gradually rounded. Head not contrasting so strongly with thorax 133

133 (132) Scutellum longitudinally striate with silky lustre . . ***MERCETENCYRTUS*** (p. 211)
– Scutellum not longitudinally striate with silky lustre 134

134 (133) Thorax and head dark and metallic. Mesoscutum with dark setae 135
– If thorax and head are dark and metallic then setae on mesoscutum are mostly white 136

135 (134) Scutellum, without axillae, slightly longer than wide or about as long as wide. Hind femur and tibia yellow, mid-tibial spur not shorter than corresponding basitarsus . ***ICEROMYIA*** (p. 204)
– Scutellum, without axillae, slightly wider than long. Hind femur and tibia mostly brown, mid tibial spur shorter than corresponding basitarsus ***AMMONOENCYRTUS*** (p. 172)

136 (134) Thorax and head dark and metallic. Mesoscutum with contrasting pale setae . . ***CHEILONEURUS*** (p. 184), ***PROCHILONEURUS*** (p. 223)
– Thorax and head orange, with darker areas not dark and metallic . . . . . ***CHEILONEURUS*** (p. 184)

137 (126) Body dorso-ventrally flattened. Scutellum flat, with punctate sculpture centrally and with a shiny, rounded border about as wide as one-quarter length of scutellum. Speculum often interrupted on dorsal surface of wing . . ***COMPERIELLA*** (p. 189)
– Body not dorso-ventrally flattened. Scutellum occasionally flat with punctate sculpture but border not smooth and shiny or, if so then sides are flat and not rounded. Speculum not interrupted 138

138 (137) Gaster only slightly longer than scutellum. First funicle segment at most only slightly longer than pedicel. Thorax not metallic, mesoscutum with dark setae. Mandibles with one tooth and a broad truncation . . . . . ***APHYCOMORPHA*** (p. 175)
– Gaster at least one and a half times as long as scutellum. If first funicle segment is not at least twice as long as pedicel then mesoscutum is dark with at least a few white setae or the mandibles have two acute teeth with the third (upper) tooth truncate . . 139

139 (138) First funicle segment at most as long as pedicel 140
– First funicle segment longer than pedicel 141

140 (139) Scape at least three and a half times as long as broad . . ***SYRPHOPHAGUS*** (p. 230)
– Scape at most three times as long as broad . . . . [***COCCIDENCYRTUS***] (p. 188)

141 (139) Postmarginal vein absent or short, at most half as long as stigmal (as in Fig. 110). Mesoscutum dark with dark setae (may be orange in species not examined). Scutellum flat 142
– Postmarginal vein nearly as long or as long as stigmal. If mesoscutum dark then with at least a few contrasting white setae or scutellum convex 144

142 (141) Scutellum with steep, very flat, polished sides . . ***NEOCOCCIDENCYRTUS*** (p. 216)
– Sides of scutellum short and curved, occasionally shiny 143

143 (142) Scutellum with apex not shiny, never metallic green, legs usually yellow with one or two dark bands . . . . ***COCCIDENCYRTUS*** (p. 188)
– Scutellum with extreme apex metallic green, legs extensively darkened, never yellow with dark bands . . . . ***GRISSELLIA*** (p. 197)

144 (141) Forewing darkened or, if hyaline then thorax mostly orange. ***CHEILONEURUS*** (p. 184)
– Forewing hyaline and thorax completely dark 145

145 (144) Setae on funicle not arranged in distinct whorls. Scutellum very convex with base sculptured and apical third shiny. Mesoscutum with numerous dark setae . . ***ECHTHRODRYINUS*** (p. 193)
– Setae on funicle normally arranged in two or three distinct whorls per segment. Scutellum usually fairly flat, never very convex, and with uniform sculpture throughout or with sides and apex shiny. Mesoscutum usually with at least some appressed white setae 146

146 (145) Submarginal vein distinctly expanded in its apical two-thirds . . ***ZAOMMA*** (p. 235)
– Submarginal vein not expanded in its apical two-thirds. . ***CHEILONEURUS*** (p. 184)

Notes on genera

Genus A

(Key couplets: ♀ 56; ♂ 64, 79)

This genus is being formally described in *Acta Zoologica Lilloana* by P. Fidalgo from San Miguel de Tucuman, Argentina. It is close to *Cheiloneurus, Diversinervus* and *Anicetus*, from which it can be separated using the characters given in the key.

ACEROPHAGOIDES Blanchard

(Key couplets: ♀ 27; ♂ 12. Fig. 20)

Acerophagoides Blanchard, 1940: 106. Type-species: *Acerophagoides triangularis* Blanchard, by monotypy.

INCLUDED SPECIES. One: *triangularis* Blanchard (De Santis, 1964: 104); also one unidentified species from Trinidad (BMNH).

DISTRIBUTION. Argentina, Trinidad.

BIOLOGY. Reared from Eriococcidae (Homoptera).

COMMENTS. Compere & Annecke (1960: 381) correctly placed the genus near *Pauridia* Timberlake (tribe Pauridiini), from which it differs in the number of funicle segments and dentition of mandibles (the third tooth of *Acerophagoides* being nearer the apex of the mandible than in *Pauridia*). Also examined is a single specimen from Trinidad (BMNH) with only four funicle segments.

ACEROPHAGUS Smith

(Key couplets: ♀ 19; ♂ 24)

Acerophagus Smith, 1880: 83. Type-species: *Acerophagus coccois* Smith, by monotypy.
Rhopoideus Howard, 1898*b*: 235. Type-species: *Rhopoideus citrinus* Howard, by monotypy.

INCLUDED SPECIES. Fourteen, eight from the Neotropics: *coccois* Smith, *debilis* Timberlake, *flavus* Rosen, *luteolus* Rosen, *notativentris* (Girault), *nubilipennis* Dozier, *pallidus* Timberlake and *texanus* (Howard).

REFERENCE. World revision: Rosen (1969).

DISTRIBUTION. Mexico, Trinidad, Jamaica, Puerto Rico. World: New World.

BIOLOGY. Parasites of Pseudococcidae (Homoptera).

COMMENTS. Very close to *Pseudaphycus* and *Timberlakia* (tribe Aphycini, subtribe Aphycina) from which it can be separated using the characters given in the key.

ACROASPIDIA Compere & Zinna

(Key couplet: ♀ 34. Fig. 17)

Acroaspidia Compere & Zinna, 1955: 96. Type-species: *Acroaspidia myrmicoides* Compere & Zinna, by monotypy.

INCLUDED SPECIES. One: *myrmicoides* Compere & Zinna (1955: 98).

DISTRIBUTION. Trinidad.

BIOLOGY. Parasite of Pseudococcidae (Homoptera).

COMMENTS. Trjapitzin (1973*a*) places the genus in the tribe Acroaspidiini which includes *Aeptencyrtus* and *Pelmatencyrtus*. Kerrich's (1978) interpretation is broader and places it in the subtribe Dinocarsiina which also includes *Zarhopalus, Chrysoplatycerus, Hambletonia* and *Zaplatycerus*. It can be easily separated from these genera and also from *Cheiloneurus*, which it superficially resembles, using the characters given in the key.

ADELENCYRTUS Ashmead

(Key couplets: ♀ 88, 243; ♂ 7. Fig. 46)

Adelencyrtus Ashmead, 1900: 401. Type-species: *Encyrtus chionaspidis* Howard, by original designation.
Epiencyrtoides Girault, 1915*d*: 108. Type-species: *Epiencyrtoides quadridentatus* Girault, by original designation.
Rotrencyrtus Risbec, 1958: 39. Types-species: *Rotrencyrtus depressus* Risbec, by monotypy.

INCLUDED SPECIES. Twenty-five, three from the Neotropics: *aulacaspidis* (Brèthes), *moderatus* (Howard) and *odonaspidis* Fullaway; also one unidentified species from Trinidad (BMNH).

REFERENCES. World key: Compere & Annecke (1961), see also Noyes (1979).

DISTRIBUTION. Throughout Neotropics. World: cosmopolitan.

BIOLOGY. Parasites of Diaspididae (Homoptera).

COMMENTS. Placed in the tribe Habrolepidini, subtribe Habrolepidina by Trjapitzin (1973*b*) which includes other genera which have quadridentate mandibles and, in the female, the head triangular in side view. The female can be separated from the included genera using the characters given in key. The males of this subtribe all have a two-segmented funicle and a long unsegmented clava and are extremely difficult to separate. A key to genera included in this subtribe is also given by Tachikawa & Valentine (1969).

AENASIUS Walker

(Key couplets: ♀ 63, 144; ♂ 7, 38. Figs 62, 113)

Aenasius Walker, 1846: 181. Type-species: *Encyrtus hyettus* Walker, by monotypy.

INCLUDED SPECIES. Twenty-seven, 26 being found in the Neotropics: *acuminatus* Kerrich, *advena* Compere, *bolowi* Mercet, *brasiliensis* (Mercet), *brethesi* De Santis, *caeruleus* Brues, *cariocus* Compere, *chapadae* Ashmead, *connectens* Kerrich, *flandersi* Kerrich, *frontalis* Compere, *hyettus* Walker, *insularis* Compere, *longiscapus* Compere, *maplei* Compere, *masii* Domenichini, *pacificus* Compere, *paulistus* Compere, *personatus* Kerrich, *phenacocci* Bennett, *punctatus* Compere, *regularis* Kerrich, *similis* Kerrich, *tachigaliae* (Brues), *vadosus* Kerrich and *vexans* Kerrich; also a further seven or eight undescribed species (BMNH).

REFERENCE. Revision: Kerrich (1967).

BIOLOGY. Parasites of Pseudococcidae (Homoptera).

DISTRIBUTION. Throughout the Neotropics. World: Nearctic region, Africa, India.

COMMENTS. Kerrich (1967) did not deal with *Aenasius bolowi* Mercet since at that time the type had not been located. Since then the type has been found in Mercet's collection and is being dealt with in a paper on Mercet's encyrtid types by the present author. The species is very close to *regularis* and *similis*, but differs in the scape bulging outwards at the apex, the top of the antennal scrobes lacking a keel or carina and the outer margin of the forewing being slightly concave.

Placed in the tribe Rhinoencyrtini, subtribe Aenasiina which also includes *Chalcaspis*, from which it can be separated using the characters given in the key.

AEPTENCYRTUS De Santis

(Key couplets: ♀ 32; ♂ 37)

Aeptencyrtus De Santis, 1964: 119. Type-species: *Pheidoloxenus bruchi* De Santis, by monotypy.

INCLUDED SPECIES. One: *bruchi* (De Santis, 1964: 119).

DISTRIBUTION. Argentina, Trinidad, St Vincent.

BIOLOGY. Parasites of Pseudococcidae (Homoptera).

COMMENTS. See under *Acroaspidia*.

AGENIASPIS Dahlbom

(Key couplets: ♀ 219; ♂ 65, 101. Fig. 130)

Ageniaspis Dahlbom, 1857: 293. Type-species: *Encyrtus fuscicollis* Dalman, by designation of Ashmead (1904: 303).

INCLUDED SPECIES. Six, one from the Neotropics: *fuscicollis* (Dalman, 1820: 359; De Santis, 1964: 312).

DISTRIBUTION. Argentina. World: cosmopolitan.

BIOLOGY. Polyembryonic parasites of larvae of Yponomeutidae (Lepidoptera).

COMMENTS. Placed in the tribe Copidosomatini, subtribe Ageniaspidiina which also includes *Paraleurocerus* and *Holcothorax* Mayr. It can be separated from *Holcothorax* (not known from South America) in having a six-segmented funicle (*Holcothorax* has five) and from *Paraleurocerus* by the characters given in the key. It is very close to *Paraleurocerus* and may eventually be considered synonymous.

AMAURILYMA Graham

(Key couplets: ♀ 190, 253; ♂ 78. Figs 94, 106, 156–158)

Amaurilyma Graham, 1958: 153. Type-species: *Encyrtus brevicornis* Dalman, by monotypy.

INCLUDED SPECIES. Three, none of which is found in the Neotropics, but at least one undetermined species from South America (BMNH; CNC, Ottawa; USNM, Washington).

DISTRIBUTION. Trinidad, Jamaica, Brazil. World: Palaearctic and Ethiopian regions.

BIOLOGY. Unknown.

COMMENTS. The material from each of the three countries mentioned above may belong to three distinct species since there are differences in the proportions of the antennal segments, sculpture of the propodeum and colour of the legs. I have also examined one specimen, which obviously belongs to this genus, from Zimbabwe (Rhodesia).

I am unable to place this genus according to Trjapitzin's (1973*b*) classification of the Encyrtidae. However, the genus does seem to be closely related to *Desobius*, but can be separated using the characters given in the key.

AMEROMYZOBIA Girault

(Key couplets: ♀ 15; ♂ 22. Figs 14, 117)

Ameromyzobia Girault, 1916*b*: 232. Type-species: *Ameromyzobia aphelinoides* Girault, by monotypy.

Included species. Two: *aphelinoides* Girault, 1916*b*: 233 and *bulyginskayae* Trjapitzin, 1971*c*: 290; also one, probably undescribed, species from Brazil (BMNH).

Distribution. St Vincent, Trinidad, Cuba. World: U.S.A., Florida (one undetermined species, BMNH).

Biology. Reared from *Diaspis* sp. (Homoptera: Diaspididae) on grass in Trinidad (BMNH).

Comments. Both of the described species and that found in Florida are very close and in fact may be a single species. The genus appears to be related to those included in the tribe Aphycini, subtribe Paraphycina, e.g. *Metaphycus*.

AMMONOENCYRTUS De Santis

(Key couplets: ♀ 49; ♂ 135. Fig. 22)

Ammonoencyrtus De Santis, 1964: 376. Type-species: *Cerapterocerus bonariensis* Brèthes, by monotypy.

Included species. Two, one from the Neotropics: *bonariensis* (Brèthes; De Santis, 1964: 378); also one undescribed species from Trinidad (BMNH) which appears to differ from both described species in the form of the antennae.

Reference. Revision: Annecke (1967: 159–160).

Distribution. Argentina, Brazil, Chile, Trinidad. World: Nearctic region.

Biology. Parasites of Coccidae (Homoptera).

Comments. Placed in the tribe Cerapterocerini which includes *Anicetus* and *Homosemion*; it can be separated from these genera using the characters given in the key. Annecke (1967) includes a key to separate all other genera included in this tribe as well as a few superficially similar genera.

ANABROLEPIS Timberlake

(Key couplets: ♀ 59, 123; ♂ 7. Figs 33, 111)

Anabrolepis Timberlake, 1920*b*: 431. Type-species: *Anabrolepis extranea* Timberlake, by original designation.

Included species. Five, one species (? *zetterstedti* (Westwood)) apparently recorded from Bermuda (F. D. Bennett, *in litt.*).

Reference. World review: Tachikawa (1955).

Distribution. Bermuda. World: Nearctic region, Palaearctic region, Pacific Islands, North Africa.

Biology. Parasites of Diaspididae (Homoptera).

Comments. I have not seen any material of this genus from South America and it may be that the record from Bermuda is actually of an *Adelencyrtus*. It is possible that *Anabrolepis* does occur in the Neotropical region and for that reason I have left it in the key.

The genus is included in the tribe Habrolepidini, subtribe Habrolepidina and can be separated from other included genera by characters given in the key and also in a key given by Tachikawa & Valentine (1969).

ANAGYRUS Howard

(Key couplets: ♀ 44, 52, 70, 114, 148, 158; ♂ 96. Figs 40, 70, 71, 131, 134)

Anagyrus Howard *in* Howard & Ashmead, 1896: 638. Type-species: *Anagyrus greeni* Howard, by monotypy.

Heterarthrellus Howard, 1898*b*: 239. Type-species: *Heterarthrellus australiensis* Howard, by monotypy.

Epidinocarsis Girault, 1913*b*: 83. Type-species: *Epidinocarsis tricolor* Girault, by monotypy.

Paranusia Brèthes, 1913: 102. Type-species: *Paranusia bifasciata* Brèthes, by monotypy. **Syn. n.**

Philoponectroma Brèthes, 1913: 104. Type-species: *Philoponectroma pectinatum* Brèthes, by monotypy. **Syn. n.**

Gyranusia Brèthes, 1920: 137. Type-species: *Gyranusia porteri* Brèthes, by monotypy. **Syn. n.**

Gyranusa Mercet, 1921: 123. Type-species: *Gyranusa matritensis* Mercet, by original designation.

Protanagyrus Blanchard, 1940: 115. Type-species: *Protanagyrus aciculatus* Blanchard, by monotypy.

Xiphomastix De Santis, 1972*b*: 45. Type-species: *Xiphomastix bellator* De Santis, by original designation.

INCLUDED SPECIES. One hundred and thirty-two, 19 from the Neotropics: *aciculatus* (Blanchard), *ananaitis* Gahan, *antoninae* Timberlake, 1920: 409, *bellator* (De Santis, 1972*b*: 46), *bifasciatus* (Brèthes) (**comb. n.**), *brevistigma* De Santis, *chilensis* Brèthes, 1916*a*: 8, *coccidivorus* Dozier, 1932: 8, *diversicornis* Mercet, 1921: 134, *graminicolens* Dozier, 1937: 123, *insolitus* (Howard; Noyes, 1979: 145), *jucundus* De Santis, *nigriceps* (De Santis, 1972*b*: 46), *porteri* (Brèthes) (**comb. n.**), *pseudococci* (Girault, 1915*b*: 185), *pulchricornis* (Howard; Noyes, 1979: 146), *saccharicola* Timberlake, 1932: 159, *tanystis* De Santis, *terebratus* (Howard; Noyes, 1979: 87); also at least a further 10 undescribed species from Trinidad, Brazil, Panama and Colombia (BMNH; CNC, Ottawa).

REFERENCES. South America: De Santis (1964). World: Peck (1963: 335).

DISTRIBUTION. Throughout the Neotropics. World: cosmopolitan.

BIOLOGY. Parasites of Pseudococcidae (Homoptera). Some species in Australia are parasites on coccinellid larvae (Coleoptera) which produce a waxy secretion and are predatory on mealybugs, e.g. *Anagyrus australiensis* (Howard).

COMMENTS. I have examined specimens (syntypes?) of *Paranusia bifasciata* Brèthes and these belong to the group of species previously placed under *Gyranusa* (which is considered by some authors to be a good genus). I have not examined the types of *Philoponectroma pectinatum* Brèthes or *Gyranusia porteri* Brèthes but since De Santis (1950: 54, 60) synonymized the genera with *Paranusia*, they are here treated as synonyms of *Anagyrus*.

Two species, *nigriceps* and *terebratus*, and a further species from Panama (CNC, Ottawa) (which runs in the ♀ key to *Apoanagyrus*, couplet 159), belong to a group with a smooth, shiny, frontovertex. According to present understanding of the group of genera to which *Anagyrus* belongs (subtribe Anagyrina), these three species could be considered as belonging to an undescribed genus. I am not convinced of this and therefore a new genus is not described here to accommodate them. Indeed, the generic limits of the genera belonging to this group, e.g. *Anagyrus, Anathrix, Apoanagyrus, Gyranusoidea, Leptomastix, Pseudleptomastix,* etc., are in some cases very difficult to define and it may be possible that further study and new material may show that some ought to be considered synonymous.

ANARHOPUS Timberlake

(Key couplets: ♀ 10; ♂ 3. Figs 10, 112)

Anarhopus Timberlake, 1929: 15. Type-species: *Anarhopus sydneyensis* Timberlake, by monotypy.

INCLUDED SPECIES. One: *sydneyensis* Timberlake (1929: 18).

DISTRIBUTION. Trinidad. World: Nearctic region, Australia.

BIOLOGY. Parasites of Pseudococcidae (Homoptera).

COMMENTS. I have not seen any South American specimens of this genus but, according to De Santis (*in litt.*), it has been found (?introduced) in Trinidad.

Placed in the tribe Tetracnemini, subtribe Arhopoideina, which also includes *Tetracnemoidea* from which it can be separated using the characters in the key.

ANATHRIX Burks

(Key couplets: ♀ 114, 131, 159)

Anathrix Burks, 1952: 179. Type-species: *Anathrix argyrus* Burks, by monotypy.
Aglyptoideus De Santis, 1964: 99. Type-species: *Aglyptoideus rusticus* De Santis, by monotypy. **Syn. n.**

INCLUDED SPECIES. Four, one from the Neotropics: *rustica* (De Santis, 1964: 101) (**comb. n.**).

REFERENCE. Review: Myartseva (1977*a*).

DISTRIBUTION. Argentina. World: Nearctic and Palaearctic regions.

BIOLOGY. Parasites of Pseudococcidae (Homoptera).

COMMENTS. Placed in the tribe Anagyrini, subtribe Anagyrina. See comments under *Anagyrus*.

ANDINOENCYRTUS Blanchard

(Key couplet: ♀ 222)

Andinoencyrtus Blanchard, 1940: 106. Type-species: *Andinoencyrtus ocellatus* Blanchard, by monotypy.

INCLUDED SPECIES. One: *ocellatus* Blanchard (De Santis, 1964: 276).

DISTRIBUTION. Argentina.

BIOLOGY. Parasites of Eriococcidae (Homoptera).

COMMENTS. I have examined the syntypes of this species. They are mounted under a single coverslip on a slide and are very badly crushed and distorted, but it is apparent that De Santis' (1964) redescription of the genus is slightly incorrect in that the marginal vein is actually slightly longer than broad and not as transverse as in his figure 135. It is probable that the cheeks are not subparallel but of more normal form, even though the cheeks of one syntype appear to be more or less parallel; this is very probably due to the head being distorted when it was squashed by the coverslip.

Andinoencyrtus is the sole genus included in the tribe Andinoencyrtini.

ANICETUS Howard

(Key couplets: ♀ 46; ♂ 132. Fig. 30)

Anicetus Howard *in* Howard & Ashmead, 1896: 639. Type-species: *Anicetus ceylonensis* Howard, by monotypy.
Asteropaeus Howard, 1898*b*: 231. Type-species: *Asteropaeus primus* Howard, by monotypy.
Habrolepopterygis Girault, 1915*d*: 86. Type-species: *Habrolepopterygis felix* Girault, by monotypy.
Krishnieriella Mani, 1935: 421. Type-species: *Krishnieriella ceroplastodis* Mani, by monotypy.

INCLUDED SPECIES. Twenty-six, three from the Neotropics: *annulatus* Timberlake, *primus* (Howard) and *quintanai* De Santis.

REFERENCE. World revision: Annecke (1967: 105–130).

DISTRIBUTION. Throughout the Neotropics. World: cosmopolitan, except more northern latitudes (40° +).

BIOLOGY. Parasites of Coccidae (Homoptera).

COMMENTS. Placed in the tribe Cerapterocerini. See comments under *Ammonoencyrtus*.

ANUSIOPTERA Brues

(Key couplet: ♀ 121. Fig. 66)

Anusioptera Brues, 1910: 83. Type-species: *Anusioptera aureocincta* Brues, by monotypy.

Included species. One, *aureocincta* Brues, 1910: 83.

Distribution. Mexico.

Biology. Probably parasitic on Pseudococcidae (Homoptera).

Comments. The holotype female of *aureocincta* is in good condition except that it is lacking the left antenna and right clava.

The genus very probably belongs to the tribe Anagyrini, subtribe Leptomastideina.

APHIDENCYRTUS Ashmead

(Key couplets: ♀ 259; ♂ 123)

Aphidencyrtus Ashmead, 1900: 398. Type-species: *Encyrtus aphidiphagus* Ashmead, by original designation.

Included species. Twenty-eight, two from the Neotropics: *aphidivorus* (Mayr, 1876: 712, 713 & 724) and *brasiliensis* Ashmead (1904*a*: 497); also one unidentified species from St Vincent (BMNH).

Reference. Key to Palaearctic species: Hoffer (1970: 78–79).

Distribution. Argentina, Brazil, Chile, Peru, Puerto Rico, St Vincent. World: cosmopolitan.

Biology. Parasites of Aphididae (secondary or primary) and in other parts of the world of Psyllidae (Homoptera).

Comments. I have not seen the type of *brasiliensis* but from the description it is very probably incorrectly placed in this genus. *Psyllaephagus trellesi* may be an *Aphidencyrtus*, but the wing venation and colour of the mesoscutum point to it being a *Psyllaephagus*. The types of this species are badly mounted on slides.

Placed in the tribe Microteryini, subtribe Syrphophagina, which also includes *Syrphophagus* Ashmead. The two genera are extremely close and sometimes impossible to separate unless the biology is known. In general specimens of *Aphidencyrtus* are smaller than *Syrphophagus*, but this is only a reflection of the size of the host. Possibly the two genera ought to be synonymized.

APHYCOMASTIX De Santis

(Key couplet: ♀ 12)

Aphycomastix De Santis, 1972*b*: 49. Type-species: *Aphycomastix annulata* De Santis, by monotypy.

Included species. One: *annulata* De Santis, 1972*b*: 49.

Distribution. Argentina, Brazil.

Biology. Unknown.

Comments. I am unable to place this genus according to Trjapitzin's classification except to say that it belongs to the Encyrtinae, possibly the tribe Aphycini, and may be close to *Cyderius*.

APHYCOMORPHA Timberlake

(Key couplets: ♀ 106, 135, 210; ♂ 138)

Aphycomorpha Timberlake, 1919*b*: 225. Type-species: *Aphycomorpha araucariae* Timberlake, by monotypy.

Included species. Two, one from the Neotropics: *araucariae* Timberlake, 1919*b*: 227.

Distribution. Mexico. World: Hawaii, New Zealand.

Biology. Parasites of Diaspididae and Eriococcidae (Homoptera).

Comments. Placed in the tribe Aphycini by Trjapitzin (1973*b*).

APOANAGYRUS Compere

(Key couplets: ♀ 69, 159; ♂ 98)

Apoanagyrus Compere, 1947: 18. Type-species: *Apoanagyrus californicus* Compere, by monotypy.

Included species. Seven, five of which occur in the Neotropics: *diversicornis* (Howard; Noyes, 1979: 148), *lopezi* De Santis, 1964: 74, *malenotus* (De Santis, 1972*b*: 44) (**comb. n.** from *Leptomastix*), *montivagus* (De Santis, 1964: 86) (**comb. n.** from *Leptomastix*) and *trinidadensis* Kerrich, 1953: 792, also two further species being described by Dr G. J. Kerrich in a paper in preparation.

Distribution. Throughout the Neotropics. World: Nearctic and Palaearctic regions.

Biology. Parasites of Pseudococcidae (Homoptera).

Comments. It is possible that both *malenotus* and *montivagus* are merely colour forms of *diversicornis.*

Placed in the subtribe Anagyrina. See comments under *Anagyrus.*

APSILOPHRYS De Santis

(Key couplets: ♀ 155; ♂ 80. Fig. 65)

Apsilophrys De Santis, 1964: 296. Type-species: *Copidosoma oeceticola* De Santis, by monotypy.
Copidencyrtus De Santis, 1964: 304. Type-species: *Copidencyrtus gracilis* De Santis, by monotypy. **Syn. n.**

Included species. Three, all from the Neotropics: *capsicum* (Burks, 1967: 54) (**comb. n.** from *Copidosoma*), *gracilis* (De Santis, 1964: 305) (**comb. n.**) and *oeceticola* De Santis (1964: 296); in addition two further unidentified species from Peru and Brazil (BMNH).

Distribution. Argentina, Brazil, Peru, Trinidad, Puerto Rico.

Biology. Polyembryonic parasites of larvae of Gelechiidae (Lepidoptera).

Comments. I have examined the holotype of *Copidencyrtus gracilis*; it is a male and belongs to *Apsilophrys.* I have not seen the holotype of *Copidosoma capsicum* but specimens which fit the description of the species and are reared from the same host and locality as the holotype undoubtedly belong to *Apsilophrys.*

Apsilophrys is very close to *Copidosoma* (Copidosomatini) but can be separated using the characters given in the key.

ARCHINUS Howard

(Key couplets: ♀ 17; ♂ 20)

Archinus Howard, 1897: 154. Type-species: *Archinus occupatus* Howard, by monotypy.

Included species. One: *occupatus* Howard (Noyes, 1979: 149).

Distribution. Grenada, Trinidad.

Biology. Unknown.

Comments. See Noyes (1979: 148–149).

ARHOPOIDIELLA gen. n.

(Key couplets: ♀ 18; ♂ 21. Figs 143–148)

Type-species: *Arhopoidiella carinata* sp. n.

♀. *Head.* In side view, moderately deep and most rounded at level of top of antennal scrobes, sometimes abruptly angled at this point, frontovertex slightly convex. Eyes slightly longer than broad, with conspicuous pubescence, overreaching occipital margin which is more or less sharp. Malar space about half length of eye with malar sulcus present. Frontovertex about one-third head width; posterior ocellus separated from occipital margin by slightly more than, to twice as much as its diameter and from eye margin by about half its diameter, ocelli forming an acute angle. Antennal scrobes deep, meeting dorsally and reaching about two-thirds from antennal toruli to anterior ocellus, top of scrobes sometimes with a transverse carina which almost reaches inner eye margins; antennal torulus separated from mouth margin by about half its length and from other torulus by about one and a half times its length, top of torulus below level of lower eye margin; scape subcylindrical and stout, pedicel conical and longer than first funicle segment, funicle five-segmented, all segments longer than broad and cylindrical, clava three-segmented, pointed apically and about as wide as funicle, longitudinal sensilla on all flagellar segments. Frontovertex with coriaceous or punctate sculpture, the latter giving it a granulate appearance, below top of antennal scrobes more shallow and elongate and almost alutaceous on genae. Frontovertex with a few short setae, those on interantennal prominence longer. Mandibles with three acute teeth, the middle tooth slightly longest, maxillary palpi three-segmented, labial palpi three-segmented.

Thorax. In side view, moderately deep and dorsally quite flat. Mesoscutum without notaular lines, about a half broader than long, axillae slightly separated by posterior margin of mesoscutum, scutellum about as long as broad and with apex pointed, propodeum medially short, less than one-eighth as long as scutellum. Pronotum and mesoscutum with shallow alutaceous sculpture, which is slightly deeper on scutellum where it is centrally of smaller mesh, mesopleura with similar sculpture, but more elongate anteriorly and tending towards punctate posteriorly, propodeum with irregular very shallow sculpture. Forewing hyaline, slightly more than three times as long as broad, basal cell sparsely hairy and completely naked in proximal one-third, speculum not interrupted and open; submarginal vein slightly expanded towards apex and with an apical hyaline break, marginal vein about twice as long as broad, stigmal vein about twice as long as marginal or post-marginal veins. Hindwing about three and a half times as long as broad. Mid tibial spur slightly shorter than corresponding basal tarsal segment.

Gaster. Slightly shorter than thorax, cerci in basal one-third, apex of hypopygium reaching to about two-thirds along gaster or to apex and slightly incised, paratergites absent. Ovipositor protruding, exserted part equal to about one-quarter to one-third length of gaster or from one-quarter to one-half as long as mid tibia; ovipositor about twice as long as mid tibia, gonostyli slightly longer than half length of mid tibia.

♂. Similar to female except clava entire. Aedeagus about two-thirds as long as mid tibia and each digitus with one thick spine apically.

Arhopoidiella carinata sp. n.

(Figs 143–148)

♀. Length (excluding ovipositor) 1·00–1·27 mm (holotype 1·06 mm).

Colour. Body generally black with weak metallic green reflections, frontovertex slightly paler; antennae testaceous to dark brown except scape and pedicel which may be darker, occasionally terminal funicle segments and clava slightly paler; legs dark brown except tarsi and apices of tibiae which are testaceous or yellow, occasionally fore tibia and tarsus completely brown; ovipositor sheaths brown.

Head. In profile sharply angled at top of antennal scrobes which have a transverse carina extending across width of frontovertex at this point (Fig. 146); posterior ocellus separated from occipital margin by slightly more than its own diameter, ocelli forming an angle of about 60°. Sculpture of frontovertex punctate so that it has a granulate appearance. Relative measurements of head of holotype: maximum head width 62, width of frontovertex across median ocellus 16·5, malar space 20, eye length 39, eye width 34, POL 7, OOL 2, length of scape 32, other proportions of antenna as in Figure 145.

Thorax. Relative measurements of forewing of holotype: length 144, maximum width 46, length of submarginal vein 60, of marginal vein 4, of stigmal vein 7, of postmarginal vein 4; of hindwing: length 93, maximum width 26. Base of forewing as in Fig. 147.

Gaster. Apex of hypopygium reaching to about two-thirds along gaster. Relative measurements of paratype: length of ovipositor 95, of gonostylus 33 [mid tibia 54]. Ovipositor as in Fig. 148.

♂. Length 0·92–1·13 mm.
Similar to female except antennae (Fig. 143) and genitalia (Fig. 144). Relative measurements of head and forewings similar to those given for female except that scape is proportionately about one-eighth shorter.

DISTRIBUTION. Trinidad, Brazil.

BIOLOGY. Unknown.

MATERIAL EXAMINED

Holotype ♀, **Trinidad**: St George, Guanapo Valley, 29.vii.1976 (J. S. Noyes) (BMNH).

Paratypes. **Brazil**: 2 ♀ 1 ♂, Santa Catarina, Nova Teutonia, 29.iv.1941; 2 ♀, Nova Teutonia, 9.v.1941; 10 ♀, 10 ♂, Nova Teutonia, iii.1950; 1 ♀, Parana, Rondon, 29.x.1952 (*F. Plaumann*) (BMNH; MLP, La Plata; CIBC, Trinidad; USNM, Washington; UC, Riverside; PPRI, Pretoria; ZI, Leningrad).

COMMENTS. Also a further two undescribed species from Trinidad (BMNH) and Brazil (CNC, Ottawa). Both differ from the type-species in lacking the transverse carina at the top of the antennal scrobes.

Superficially the females of this genus resemble *Tetracnemoidea*, but can be easily separated using the characters given in the key. The males differ in having the antennae simple, without rami.

The genus is best placed in the subfamily Encyrtinae (as defined by Trjapitzin, 1973*b*) but placement to tribe is difficult. It may be related to *Ooencyrtus* and *Echthrodryinus* but differs from these in the mandibles having three acute teeth, the hypopygium reaching or very nearly reaching the apex of the gaster, and the male having very similar antennae to the female as in some genera included in the subtribe Aphycina.

ARRHENOPHAGOIDEA Girault

(Key couplet ♀ 21. Figs 21, 141, 142)

Arrhenophagoidea Girault, 1915*d*: 73. Type-species: *Arrhenophagoidea coloripes* Girault, by monotypy.

INCLUDED SPECIES. Four, none of which are known to occur in the Neotropics, but one undescribed species from Trinidad (BMNH).

REFERENCE. Revision: Annecke & Prinsloo (1974).

DISTRIBUTION. Trinidad. World: South Africa, Australia.

BIOLOGY. Parasites of Diaspididae (Homoptera).

COMMENTS. Fig. 21 is drawn from the collapsed head of the only specimen of this genus taken from Trinidad. The head of dry mounted material of this genus generally collapses in this way, giving it a rather narrow, elongate appearance, but in live specimens or in slide mounted material the head is of more normal encyrtid shape.

The South American species differs from the other known species in having clearly tridentate mandibles, rather flattened hind tibia and enlarged fifth tarsal segment (Fig. 141), and a long distinct stigmal vein (Fig. 142). I had originally considered describing a new genus to accommodate this species, but now feel that it is best to include it in the present genus.

Placed in the tribe Psyllechthrini.

ARRHENOPHAGUS Aurivillius

(Key couplets: ♀ 1; ♂ 30. Fig. 6)

Arrhenophagus Aurivillius, 1888: 144. Type-species: *Arrhenophagus chionaspidis* Aurivillius, by monotypy.
Mymariella Risbec, 1951: 402. Type-species: *Mymariella parlatoriae* Risbec, by monotypy.

INCLUDED SPECIES. Three, one of which occurs in the Neotropics: *chionaspidis* Aurivillius.

REFERENCE. Annecke & Prinsloo (1974).

DISTRIBUTION. Argentina, Peru, Guyana, Puerto Rico, Jamaica and Barbados. World: Nearctic and Palaearctic regions, India, Africa.

BIOLOGY. Parasites of Diaspididae (Homoptera).

COMMENTS. The only genus included in the tribe Arrhenophagini.

ASEIRBA Cameron

(Key couplets: ♀ 152; ♂ 93)

Aseirba Cameron, 1884: 127. Type-species: *Aseirba caudata* Cameron, by monotypy.

INCLUDED SPECIES. One: *caudata* Cameron (= *cultrata* Kerrich) and a further four undescribed species from Brazil (BMNH; CNC, Ottawa).

DISTRIBUTION. Brazil, Guatemala.

BIOLOGY. Unknown.

COMMENTS. One of the two female syntypes of *caudata* Cameron (labelled: 'Torola, 1000ft, champion, B.C.A. Hymen. I *Aseirba caudata*, Cam., "*Aseirba caudata* Cam. type. BCA Hy. 1.128"') in the BMNH is here designated LECTOTYPE.

Kerrich (1954: 371) treated *Aseirba* as a junior synonym of *Cerchysius* and proposed the name *cultratus* as a replacement name for *caudatus* Cameron nec Forster, 1841. Since *Aseirba* is here considered distinct from *Cerchysius* the original species name is reverted to since *cultratus* has not been used since it was originally proposed.

The four undescribed species differ from *caudata* in having the hypopygium not extending to the apex of the gaster whereas in *caudata* it reaches the apex. The mandibles are bidentate and not tridentate as stated by Kerrich. I hesitate to describe a new genus to accommodate the four undescribed species on the differences exhibited by the hypopygium until the taxonomic significance of this character can be fully ascertained. The genus may possibly belong to the tribe Bothriothoracini, and is very probably near *Hemencyrtus*.

ATELAPHYCUS Blanchard

Atelaphycus Blanchard, 1940: 107. Type-species, *Atelaphycus eriococci* Blanchard, by monotypy.

INCLUDED SPECIES. One: *eriococci* Blanchard (1940: 107).

DISTRIBUTION. Argentina.

BIOLOGY. Parasites of Eriococcidae (Homoptera).

COMMENTS. The type of *eriococci* Blanchard is apparently lost (De Santis, 1964: 119). It is impossible to place the genus from the short description, but it may be close to and possibly synonymous with *Metaphycus*. Species of *Metaphycus* with exserted ovipositors are known from South America.

AVETIANELLA Trjapitzin

(Key couplets: ♀ 213; ♂ 58. Fig. 128)

Avetianella Trjapitzin, 1968: 97. Type-species: *Avetianella capnodiobia* Trjapitzin, by monotypy.

INCLUDED SPECIES. Two, neither known from the Neotropics, but two undescribed species from Trinidad (BMNH; CNC, Ottawa) and Brazil (BMNH).

REFERENCE. Trjapitzin (1971*d*).

DISTRIBUTION. Trinidad, Brazil. World: Holarctic.

BIOLOGY. Parasites of eggs of Cerambycidae and Scolytidae (Coleoptera).

COMMENTS. Placed in the tribe Microteryini, subtribe Oobiina.

AZTECENCYRTUS Timberlake

(Key couplet: ♀ 101)

Aztecencyrtus Timberlake, 1926: 16. Type-species: *Aztecencyrtus flavus* Timberlake, by monotypy.

INCLUDED SPECIES. Two: *flavus* Timberlake (1926: 18) and *iceryae* (Howard, 1882: 379) (**comb. n.** from *Cerchysius* Westwood).

DISTRIBUTION. Mexico, Jamaica.

BIOLOGY. Parasites of Margarodidae (Homoptera).

COMMENTS. Apparently close to *Cirrencyrtus* from which it can be separated using the characters given in the key. Possibly best placed in the tribe Aphycini, subtribe Aphycina, although Trjapitzin (1973*b*) includes it in the tribe Homalotylini, which may be correct. The only known specimens of the two included species are the holotypes and both lack the clavae which appear to be the only certain means of separating the Aphycina from the Homalotylini.

BAEOENCYRTUS De Santis

(Key couplet: ♂ 52. Fig. 127)

Baeoencyrtus De Santis, 1964: 204. Type-species: *Baeoencyrtus platys* De Santis, by monotypy.

INCLUDED SPECIES. One: *platys* De Santis (1964: 205).

DISTRIBUTION. Argentina.

BIOLOGY. Unknown.

COMMENTS. The holotype of *platys* is on a slide and is therefore difficult to place systematically. It may be near *Metaphycus* (tribe Aphycini, subtribe Paraphycina).

***BENNETTISCA* gen. n.**

(Key couplet: ♀ 78. Figs 43, 149, 150)

Type-species: *Bennettisca flavigena* sp. n.

♀. *Head.* In side view, moderately deep and most strongly curved at a level with top of antennal scrobes, frontovertex only slightly convex. Eye about one-third longer than broad, naked, very nearly reaching occipital margin which is sharp. Malar space nearly three-quarters as long as eye and with malar sulcus absent. Frontovertex a little more than one-third head width; posterior ocellus separated from eye margin and occipital margin by less than its own diameter, ocelli more or less forming a right angle. Antennal scrobes moderately deep, meeting dorsally and reaching about half way between antennal toruli and anterior ocellus; antennal torulus separated from mouth margin by slightly less than its own length and from other torulus by nearly twice its own length, top of torulus slightly below level of lower eye margin; scape slightly broadened and flattened, shorter than malar space, pedicel conical and longer than half length of funicle which is six-segmented, all funicle segments transverse and cylindrical, distinctly broadening distally, clava three-segmented, much wider and slightly longer than funicle and with a broad oblique apical truncation, longitudinal sensilla on sixth funicle segment and clava. Frontovertex with numerous colourless setae and with fine, closely meshed, coriaceous sculpture which gives it an almost granulate appearance, sculpture becoming more elongate on lower parts of face, almost transversely strigose between eyes and scrobes, more normal on cheeks and interantennal prominence. Mandibles with two short, acute teeth and a short truncation, maxillary palpi four-segmented, labial palpi three-segmented.

Thorax. In side view, moderately deep, scutellum flat. Mesoscutum without notaular lines and about two and half times as broad as long, axillae meeting apically, scutellum slightly longer than broad with apex acute and with a very broad translucent flange along sides and at apex, flange about one-eighth as long as scutellum, completely covering the propodeum medially and slightly downcurved apically as in *Blanchardiscus* (Fig. 12), propodeum medially about one-eighth as long as scutellum (without flange). Mesoscutum, axillae, scutellum and mesopleura with fine, closely meshed coriaceous sculpture and covered with numerous short, pale setae (except mesopleura), propodeum with slightly elongate, reticulate sculpture extending to spiracles, metanotum with similar sculpture. Forewing hyaline, slightly more than twice as long as broad, densely hairy, basal cell and costal cell dorsally with setae as dense as in centre of wing; submarginal vein with an apical hyaline break which extends to anterior wing margin and is more or less confluent with the speculum; marginal vein very transverse, almost absent and not reaching anterior margin of wing, postmarginal vein absent, stigmal vein about one-quarter as long as the submarginal; marginal cilia absent at wing apex and along anterior margin of wing. Hind wing about three times as long as broad. Mid tibial spur about as long as mid basal tarsal segment.

Gaster. About as long as thorax and sides with strigose sculpture and very hairy. Cerci about one-third along gaster, paratergites absent, hypopygium more or less reaching apex of gaster and produced as in *Mucrencyrtus* (Fig. 84) but with projection relatively shorter. Ovipositor about two-thirds as long as mid tibia and hidden, gonostylus about one-fifth as long as mid tibial spur.

♂. Unknown.

Named in honour of Dr F. D. Bennett.

Bennettisca flavigena **sp. n.**

(Figs 43, 149, 150)

♀. Length 0·85–0·90 mm (holotype 0·85 mm).

Colour. Body generally yellowish orange, slightly paler ventrally. Upper and lower margins of scape, metanotum, anterior margin of propodeum and dorsum of gaster brown; cheeks, temples and clypeal margin very slightly infuscate; mid and hind tibia with some faintly darker areas.

Head. Relative measurements of head of holotype: maximum head width 66, frontovertex width at median ocellus 23, malar space 25, eye length 37, eye width 30, POL 15, OOL 2·5, scape length 18, other proportions of antenna as in Fig. 43.

Thorax. Relative measurements of forewing of holotype: length 122, maximum width 53, length of submarginal vein 58, marginal vein 2, stigmal vein 13; of hindwing: length 87, maximum width 28. Base of forewing as in Fig. 150.

Gaster. Relative measurements of paratype: ovipositor length 38, gonostylus length 3 [mid tibia 48, mid tibial spur 16]. Ovipositor as in Fig. 149.

♂. Unknown.

DISTRIBUTION. Trinidad.

BIOLOGY. Unknown, but probably parasites of Aclerdidae (Homoptera).

MATERIAL EXAMINED

Holotype ♀, **Trinidad**; Curepe, Santa Margarita Circular Road, 9–23.vi.1974, Moericke trap (*F. D. Bennett*) (CNC, Ottawa).

Paratype. 1 ♀, same data as holotype (BMNH).

COMMENTS. I have examined a further female from Trinidad (CNC, Ottawa) which was provisionally placed in this genus, but it has a much longer marginal vein (about four times as long as broad), more dense setae on the thorax and gaster, and the setae on the submarginal vein, marginal vein and along the distal margin of the basal cell are very much thicker. I feel it best to exclude this species from *Bennettisca* for the present, but future work may show that it can be satisfactorily accommodated here.

Bennettisca belongs to the same group of genera as *Allencyrtus* Annecke & Mynhardt and *Mucrencyrtus* (subtribe Microteryina) which both include parasites of Aclerdidae. It differs in the form of the antennae, sharp occipital margin, broad translucent flange on scutellum and forewing venation. Both *Allencyrtus* and *Mucrencyrtus* have funicle segments all longer than broad, rounded occipital margin, very short or non-existent flange on scutellum and longer marginal vein. Also included in this group of genera is *Paramucrona* which has setae in basal and costal cell of forewing rather sparse and all the funicle segments longer than broad.

BLANCHARDISCUS De Santis

(Key couplets: ♀ 20; ♂ 16. Figs 12, 13, 115)

Blanchardiscus De Santis, 1964: 268. Type-species: *Blanchardiscus scutellaris* De Santis, by monotypy.

INCLUDED SPECIES. One: *scutellaris* De Santis, 1964: 268.

DISTRIBUTION. Argentina, Brazil.

BIOLOGY. Unknown.

COMMENTS. Placed in the tribe Blanchardiscini.

BLEPYRUS Howard

(Key couplets: ♀ 143, 236, 250; ♂ 9)

Blepyrus Howard, 1898*b*: 234. Type-species: *Blepyrus mexicanus* Howard, by designation of Ashmead, (1900: 373).

Coccophoctonus Ashmead, 1900: 375. Type-species: *Coccophoctonus dactylopii* Ashmead, by monotypy.

INCLUDED SPECIES. Two: *clavicornis* (Compere) and *insularis* (Cameron); also a further two or three undescribed species from Trinidad (BMNH).

REFERENCE. Revision: Kerrich (1967: 225–228).

DISTRIBUTION. Brazil, Guyana, Colombia, Trinidad, Mexico. World: Nearctic region, Pacific Islands, South East Asia, India, Africa.

BIOLOGY. Parasites of Pseudococcidae (Homoptera).

COMMENTS. Placed in the tribe Neodiscini.

BOTHRIOCRAERA Timberlake

(Key couplets: ♀ 18; ♂ 21)

Bothriocraera Timberlake, 1916: 567. Type-species: *Bothriocraera flavipes* Timberlake, by monotypy.

INCLUDED SPECIES. Two, one from the Neotropics: *bicolor* Compere & Zinna, 1955: 101.

DISTRIBUTION. Trinidad. World: Nearctic.

BIOLOGY. Parasites of Pseudococcidae (Homoptera).

COMMENTS. Placed in the tribe Aphycini, subtribe Aphycina.

BOTHRIOTHORAX Ratzeburg

(Key couplets: ♀ 129, 184; ♂ 111. Fig. 87)

Bothriothorax Ratzeburg, 1844: 209. Type-species: *Bothriothorax altensteinii* Ratzeburg, by monotypy.

Trimorphocerus Dahlbom, 1857: 292. Type-species: *Bothriothorax altensteinii* Ratzeburg, by designation of Gahan & Fagan (1923: 149).

INCLUDED SPECIES. Twenty-seven, none of which occurs in the Neotropics, but one undetermined species from Trinidad (BMNH).

REFERENCE. Peck (1963: 375).

DISTRIBUTION. Trinidad. World: Holarctic.

BIOLOGY. Parasites of larvae of Syrphidae (Diptera).

COMMENTS. Placed in the tribe Bothriothoracini, subtribe Bothriothoracina.

BRACHYPLATYCERUS De Santis

(Key couplets: ♀ 5; ♂ 92. Fig. 9)

Brachyplatycerus De Santis, 1972*b*: 49. Type-species: *Brachyplatycerus minutus* De Santis, by monotypy.

INCLUDED SPECIES. One: *minutus* De Santis, 1972*b*: 50; also two further undescribed species from Trinidad and one from Brazil (BMNH).

DISTRIBUTION. Argentina, Brazil, Trinidad.

BIOLOGY. Unknown.

COMMENTS. Appears to be very close to *Hemaenasius*, differing only in the number of funicle segments. *Hemaenasius* has been placed in the tribe Discodini, subtribe Hemaenasiina by Trjapitzin & Gordh (1978*b*).

BRETHESIELLA Porter

(Key couplets: ♀ 140; ♂ 49. Fig. 63)

Brethesia Timberlake, 1919*a*: 190. Type-species: *Brethesia latifrons* Timberlake, by original designation. [Homonym of *Brethesia* Schrottky, 1909.]
Brethesiella Porter, 1920: 16. [Replacement name for *Brethesia* Timberlake.]
Brethesiella Timberlake, 1920*a*: 96. [Replacement name for *Brethesia* Timberlake.]
Perissodromus Blanchard, 1940: 107. Type-species: *Perissodromus longipes* Blanchard, by monotypy.
Neocopidosoma Blanchard, 1940: 126. Type-species: *Neocopidosoma coccidophaga* Blanchard, by monotypy. [Homonym of *Neocopidosoma* Ishii, 1923.] **Syn. n.**
Noblanchardia Ghesquière, 1946: 369. [Replacement name for *Neocopidosoma* Blanchard.] **Syn. n.**

INCLUDED SPECIES. Four: *abnormicornis* (Girault, 1917*a*: 118), *coccidophaga* (Blanchard; De Santis, 1964: 176) (**comb. n.**), *latifrons* (Timberlake; De Santis, 1964: 171) and *longipes* (Blanchard; De Santis, 1964: 172).

DISTRIBUTION. Argentina, Brazil, Trinidad.

BIOLOGY. Parasites of Margarodidae (Homoptera).

COMMENTS. I have examined the holotype of *Neocopidosoma coccidophaga*. It is a male and belongs to *Brethesiella*. All four species are extremely close and may just be forms of a single species.

Both Timberlake (1919*a*: 193) and Tachikawa (1978: 49) state that they believe the host of *Brethesiella* is actually chrysopid or hemerobiid larvae (Neuroptera) predatory on *Icerya* Signoret (Homoptera: Coccoidea, Margarodidae). However, both Dr F. D. Bennett and I (CIBC, Trinidad) have reared specimens of this genus in very large numbers from *Icerya montserratensis* Riley & Howard.

Placed in the tribe Homalotylini, subtribe Brethesiella.

CALLIENCYRTUS De Santis

(Key couplet: ♀ 104)

Calliencyrtus De Santis, 1960: 61. Type-species: *Calliencyrtus bucculentus* De Santis, by monotypy.

INCLUDED SPECIES. One: *bucculentus* De Santis, 1960: 63.

Distribution. Brazil.

Biology. Unknown.

Comments. I am unable to place the genus according to Trjapitzin (1973*b*) classification of the Encyrtidae.

CARABUNIA Waterston

(Key couplets: ♀ 125; ♂ 60. Fig. 64)

Carabunia Waterston, 1928: 249. Type-species: *Carabunia myersi* Waterston, by monotypy.

Included species. Five, two from the Neotropics: *myersi* Waterston and *waterstoni* Subba Rao, and one undetermined species from Colombia (AMNH, New York).

Reference. Revision of world species: Subba Rao (1973).

Distribution. Colombia, Cuba, Puerto Rico, Jamaica. World: Africa and Asia.

Biology. Parasites of Cercopidae (Homoptera).

Comments. Placed in the tribe Neocladini.

CERCHYSIUS Westwood

(Key couplets: ♀ 153, 154)

Cerchysius Westwood, 1832: 128. Type-species: *Encyrtus urocerus* Dalman, by designation of Westwood (1840: 73).

Included species. Nineteen, none of which occurs in the Neotropics, but two undetermined species from Ecuador (CNC, Ottawa) and Peru (BMNH) and perhaps also *Prionomitus fuscipalpis* Kieffer *in* Kieffer & Jörgensen, 1910: 413.

Reference. Partial world revision: Kerrich (1954).

Distribution. Ecuador, Peru. World: cosmopolitan.

Biology. Parasites of Chamaemyiidae (Diptera).

Comments. Placed in the tribe Microteryini, subtribe Pseudencyrtina.

CHALCASPIS Howard

(Key couplets: ♀ 141; ♂ 7)

Chalcaspis Howard, 1895: 606. Type-species: *Chalcaspis pergandei* Howard, by monotypy.

Included species. Four, one from the Neotropics: *lucida* Kerrich.

Reference. Revision: Kerrich (1967: 191–195).

Distribution. Cuba. World: Nearctic.

Biology. Parasites of Pseudococcidae (Homoptera).

Comments. Placed in the tribe Rhinoencyrtini, subtribe Aenasiina.

CHEILONEURUS Westwood

(Key couplets: ♀ 34, 58, 95; ♂ 86, 115, 131, 136, 144, 146. Fig. 36)

Cheiloneurus Westwood, 1833: 343. Type-species: *Encyrtus elegans* Dalman, by monotypy.
Chrysopophagus Ashmead, 1894: 246. Type-species: *Chrysopophagus compressicornis* Ashmead, by monotypy.

Blatticida Ashmead, 1904: 305. Type-species: *Blatticida pulchra* Ashmead, by monotypy.
Cristatothorax Girault, 1911: 169. Type-species: *Cristatothorax pulcher* Girault, by monotypy.
Metacheiloneurus Hoffer, 1957: 336. Type-species: *Metacheiloneurus moestus* Hoffer, by monotypy. **Syn. n.**

Included species. Ninety-four, 11 from the Neotropics: *albinotatus* De Santis, *angulatus* De santis, *cristatus* De Santis, *cupreicollis* Ashmead, *elegans* (Dalman), *gahani* (Dozier, 1927: 270) (**comb. n.** from *Achrysopophagus*), *inimicus* Compere, 1925: 297, *loretanus* De Santis, 1972: 60, *nigrescens* Howard (= *longisetaceus* De Santis), *praenitens* Waterston, 1922: 49 and *pulvinariae* Dozier, 1927: 363; also a further ten or more undetermined species (BMNH; USNM, Washington).

Reference. Revision of Argentinian species: De Santis (1964: 332–353).

Distribution. Throughout the Neotropics. World: cosmopolitan.

Biology. Hyperparasites of other Chalcidoidea, mainly Encyrtidae and Aphelinidae (Hymenoptera).

Comments. Placed in the tribe Cheiloneurini.

CHRYSOPLATYCERUS Ashmead

(Key couplets: ♀ 46; ♂ 36. Fig. 26)

Rileya Howard, 1888: 80. Type-species: *Rileya splendens* Howard, by monotypy. [Homonym of *Rileya* Ashmead, 1888.]
Chrysoplatycerus Ashmead, 1889: 38. [Replacement name for *Rileya* Howard.]
Encyrtolophus De Santis, 1972*b*: 49. Type-species: *Encyrtolophus flavicollis* De Santis, by monotypy.
Paraplatycerus Hall, 1974: 19. Type-species: *Paraplatycerus citriculus* Hall, by monotypy.
Metaplatycerus Gordh & Trjapitzin *in* Trjapitzin & Gordh, 1978*a*: 384. Type-species: *Chrysoplatycerus ferrisi* Timberlake, by monotypy. **Syn. n.**

Included species. Four, three of which occur in the Neotropics: *colombiensis* Kerrich, *flavicollis* (De Santis) and *splendens* (Howard).

Reference. Revision: Kerrich (1978: 136–142).

Distribution. Throughout the Neotropics. World: Nearctic region, South Africa.

Biology. Parasites of Pseudoccidae (Homoptera).

Comments. I disagree with Trjapitzin & Gordh's (1978*a*) view that *ferrisi* requires generic status. *C. flavicollis* exhibits characters intermediate between *splendens* and *ferrisi*, notably in the structure of the mesoscutum and scutellum, although it is nearest to *ferrisi*. If *Metaplatycerus* and *Chrysoplatycerus* were to be maintained as separate genera then *Metaplatycerus* should be considered a junior synonym of *Encyrtolophus*.

Placed in the tribe Chrysoplatycerini, subtribe Chrysoplatycerina.

CIBDELOENCYRTUS De Santis

(Key couplet: ♀ 231)

Cibdeloencyrtus De Santis, 1964: 209. Type-species: *Cibdeloencyrtus aphelinoides* De Santis, by monotypy.

Included species. One: *aphelinoides* De Santis, 1964: 210.

Distribution. Argentina.

Biology. Unknown.

Comments. Difficult to place according to Trjapitzin's (1973*b*) classification, but it is possibly related to *Echthroplexiella* (tribe Miraini, subtribe Echthroplexiellina).

CICOENCYRTUS gen. n.

(Key couplets: ♀ 240; ♂ 54. Figs 108, 151–155)

Type-species: *Cicoencyrtus angustifrons* sp. n.

♀. *Head*. In side view moderately deep and slightly angled at a level with dorsal margin of antennal scrobes, frontovertex slightly convex. Eye about one-half longer than broad, clothed with short, pale setae and overreaching occipital margin which is rounded. Malar space less than half as long as eye and with malar sulcus absent. Frontovertex narrow, less than one-fifth head width; posterior ocellus separated from occipital margin by slightly more than its own diameter and almost touching eye margin, ocelli forming a strongly acute angle of about 25–45°. Antennal scrobes moderately impressed, long and narrow, meeting dorsally, reaching slightly more than half way between antennal toruli and anterior ocellus and sharply separated from frontovertex; antennal torulus separated from mouth margin by much less than half its own length and from other torulus by slightly less than twice its own length, top of torulus slightly below level of lower eye margin; scape subcylindrical and stout, pedicel conical and about as long as the first four funicle segments together, funicle six-segmented, segments transverse, cylindrical and broadening distally, distal segments occasionally quadrate or slightly longer than broad, clava three-segmented and rounded apically, more than half as long as funicle, longitudinal sensilla on apical two or three funicle segments and clava. Frontovertex with shallow coriaceous sculpture except between and behind ocelli where it is more coarse and sometimes granulate in appearance, more elongate on lower parts of face, sparse brown setae on frontovertex and cheeks, interantennal prominence with at least a few conspicuous white setae. Mandibles with three acute teeth, maxillary palpi four-segmented, labial palpi three-segmented.

Thorax. In side view moderately deep and dorsally more or less flat. Mesoscutum without notaular lines, slightly broader than long, axillae touching, scutellum about as long as broad and with apex more or less rounded, propodeum very short, medially less than one-tenth as long as scutellum. Pronotum, mesoscutum and axillae slightly shiny and with coriaceous sculpture, scutellum matt and with punctiform sculpture giving it an almost granulate appearance, mesopleura anteriorly with shallow strigose sculpture becoming more regular and reticulate posteriorly, propodeum centrally smooth, but with some irregular, shallow sculpture laterally. Forewing hyaline, nearly two and half times as long as broad, basal cell sparsely hairy and naked proximally, speculum not interrupted but more or less closed; submarginal vein with an apical hyaline break, marginal vein about as long as broad to nearly twice as long as broad, stigmal at least about twice as long as marginal, postmarginal about as long as marginal or slightly shorter. Hind wing about three and a half times as long as broad. Mid tibial spur much shorter than mid basal tarsal segment.

Gaster. Slightly shorter than thorax. Cerci slightly more than one-third along gaster, paratergites absent, apex of hypopygium from about one half to three-quarters along gaster and incised apically, exserted part of ovipositor equal to about two-thirds length of gaster or mid tibia. Ovipositor about one and half times as long as gaster or slightly more than twice as long as mid tibia, gonostylus slightly longer than mid tibia.

♂. Similar to female except for genitalia and clava which is entire.

Cicoencyrtus angustifrons sp. n.

(Figs 108, 151–155)

♀. Length (excluding ovipositor): 1·33–1·49 mm (holotype 1·33 mm).

Colour. Frontovertex reddish brown, black between ocelli and on occipital margin between eyes; lower parts of face and antennal scrobes black, slightly tinged green, particularly on genae; eyes reddish; scape and basal half of pedicel brown, apical half of pedicel and flagellum yellowish organge, slightly darker proximally; thorax black, tinged green with some slightly paler areas which are dark brownish orange; legs brown, except apical half of all tibiae and arsi which are yellowish testaceous; metanotum and centre of propodeum brownish orange; gaster dark brown with cercal plates ringed orange-brown, ovipositor sheaths dark brown.

Head. In frontal aspect as in Fig. 108. Ocelli forming an angle of about 25–30°. Relative measurements of head of holotype: maximum head width about 67, minimum width of frontovertex 8, malar space 25, eye length about 55, eye width about 36, POL 5, OOL 1, scape length 38, other proportions of antenna as in Fig. 154.

Thorax. Relative measurements of forewing of holotype: length 172, maximum width 78, length of submarginal vein 72, narginal vein 5·5, stigmal vein 14, postmarginal vein 5·5; of hindwing: length 112, maximum width 30.

Gaster. Apex of hypopygium about half way along gaster. Relative measurements of gaster of paratype: length of exserted part of ovipositor 52, length of ovipositor 147, length of gonostylus 74 [mid tibia 66]. Ovipositor as in Fig. 155.

♂. Length 1·23–1·29 mm.
As for female. Antenna as in Fig. 151, base of forewing 154, genitalia 152. Aedeagus just over half as long as mid tibia, digiti each with two spines at apex.

DISTRIBUTION. Brazil.

BIOLOGY. Unknown.

MATERIAL EXAMINED

Holotype ♀, **Brazil**: Santa Catarina, Nova Teutonia, 2.xi.1944 (*F. Plaumann*) (BMNH).

Paratypes. **Brazil**: 1 ♀, 2 ♂, Santa Catarina, Nova Teutonia, 20.ix.1944, 14.x.1944, 13.x.1944 respectively (*F. Plaumann*) (BMNH).

COMMENTS. Also one further undescribed species from Brazil (BMNH) and Trinidad (CNC, Ottawa), the female of which differs from the type-species in having a wider frontovertex and a more or less anelliform fourth funicle segment.

The genus appears to be related to *Archinus* but can be easily separated by having six funicle segments (*Archinus* has five). Possibly best placed in the tribe Aphycini, subtribe Paraphycina.

CIRRHENCYRTUS Timberlake

(Key couplets: ♀ 101, 211; ♂ 44, 53)

Cirrhencyrtus Timberlake, 1918: 360. Type-species: *Cirrhencyrtus ehrhorni* Timberlake, by monotypy.
Neoanisotylus De Santis, 1939: 330. Type-species: *Neoanisotylus bimaculatus* De Santis, by monotypy.

INCLUDED SPECIES. Four, two of which are found in the Neotropics: *bimaculatus* (De Santis, 1939: 331) and *diversicolor* (Compere, 1939: 62) (**comb. n.** from *Waterstonia*).

DISTRIBUTION. Brazil, Argentina, Trinidad. World: Holarctic region.

BIOLOGY. Parasites of Pseudococcidae (Homoptera).

COMMENTS. I have not seen any types of *Waterstonia diversicolor*, but it is clear from the description that it belongs to *Cirrhencyrtus* and is very close to *bimaculatus*.

Trjapitzin & Gordh (1978*b*) place the genus in the tribe Homalotylini, subtribe Homalotylina. In my view this genus would be better placed in the tribe Aphycini, subtribe Aphycina. I have examined specimens determined by Timberlake as *Cirrhencyrtus ehrhorni* and also the holotype of *Neoanisotylus bimaculatus* and both show remarkable similarities to the species of *Aphycus* Mayr, particularly the latter. They differ principally in having the well-marked notaular lines (absent in *Aphycus*) and relatively longer ovipositor. Perhaps this genus shows a closer relationship between the two subtribes than Trjapitzin's (1973*b*) classification would infer.

COCCIDAPHYCUS Blanchard

(Key couplets: ♀ 26; ♂ 13)

Coccidaphycus Blanchard, 1940: 110. Type-species: *Coccidaphycus nigricans* Blanchard, by monotypy.

INCLUDED SPECIES. One: *nigricans* Blanchard (De Santis, 1964: 244); also one undescribed species from Trinidad (BMNH).

DISTRIBUTION. Argentina, Trinidad.

BIOLOGY. Parasites of Coccidae (Homoptera).

COMMENTS. The genus appears to be very close to *Trechnites* Thomson (tribe Trechnitini, subtribe Trechnitina) but differs in the longer marginal vein, very slight triangular expansion at apex of submarginal vein and host (*Trechnites* spp. are psyllid parasites).

COCCIDENCYRTUS Ashmead

(Key couplets: ♀ 68, 88, 89, 167, 222, 244; ♂ 130, 140, 143. Figs 39, 47)

Coccidencyrtus Ashmead, 1900: 383. Type-species: *Encyrtus ensifer* Howard, by monotypy.
Coccidencyrtoides Blanchard, 1940: 107. Type-species: *Coccidencyrtoides annulipes* Blanchard, by designation of De Santis (1967*b*: 161).

INCLUDED SPECIES. Twenty-four, seven from the Neotropics: *annulipes* (Blanchard), *blanchardi* (De Santis), *denieri* Blanchard, *grioti* Blanchard, *maculicornis* (Blanchard), *malloi* Blanchard and *obesus* De Santis; also a further four or five undetermined species from Brazil and Trinidad (BMNH; CNC, Ottawa).

REFERENCE. Revision of Argentinian species: De Santis (1964: 218–231).

DISTRIBUTION. Argentina, Brazil, Trinidad. World: cosmopolitan.

BIOLOGY. Parasites of Diaspididae (Homoptera).

COMMENTS. The types of *denieri* and *grioti* are apparently lost and the names should be considered nomina dubia, but in any case *denieri* cannot belong in *Coccidencyrtus* because the frontovertex is too narrow. I have not see the types of either *maculicornis* or *malloi* but, from De Santis' (1964) redescriptions of these species, they may be correctly placed. The only described species from South America which are with certainty correctly placed are *blanchardi* and *annulipes*; *obesus* does not belong in *Coccidencyrtus* but at present I cannot place it generically.

Placed in the tribe Habrolepidini (Trjapitzin & Gordh, 1978*b*).

COCCIDOCTONUS Crawford

(Key couplets: ♀ 186, 223; ♂ 105. Fig. 89)

Coccidoctonus Crawford, 1912: 167. Type-species: *Coccidoctonus trinidadensis* Crawford, by monotypy.
Quaylea Timberlake, 1919*b*: 214. Type-species: *Cerchysius whittieri* Girault, by original designation. **Syn. n.**

INCLUDED SPECIES. Two, one of which is found in the Neotropics: *trinidadensis* Crawford, 1912: 168.

DISTRIBUTION. Trinidad, Barbados, Grenada, St Vincent. World: Nearctic region, South East Asia, Australia.

BIOLOGY. Hyperparasite of other Encyrtidae and of Pteromalidae (Hymenoptera) parasitizing Coccidae and Pseudococcidae (Homoptera).

I have examined specimens determined by Timberlake as *Quaylea whittieri* and these belong to *Coccidoctonus* (**comb. n.**), although they are a distinct species from *trinidadensis*.

I am unable to place the genus according to Trjapitzin's (1973*b*) classification of the Encyrtidae.

COELASPIDIA Timberlake

(Key couplets: ♀ 30; ♂ 39)

Coelaspidia Timberlake, 1923: 326. Type-species: *Coelaspidia osborni* Timberlake, by monotypy.

INCLUDED SPECIES. One: *osborni* Timberlake, 1923: 330.

DISTRIBUTION. Mexico.

BIOLOGY. Parasites of Pseudococcidae (Homoptera).

COMMENTS. Placed in the tribe Acroaspidiini.

COELOPENCYRTUS Timberlake

(Key couplets: ♀ 89, 252; ♂ 40. Figs 100, 120)

Coelopencyrtus Timberlake, 1919*b*: 218. Type-species: *Coelopencyrtus odyneri* Timberlake, by original designation.
Nesencyrtus Timberlake, 1919*b*: 223. Type-species: *Adelencyrtus kaalae* Ashmead, by monotypy.
Batrachencyrtus Jansson, 1957: 71. Type-species: *Batrachencyrtus callidii* Jansson, by monotypy.

Included species. Nineteen, one of which is found in the Neotropics: *gargaris* (Walker) (= *Giraultella lopesi* Costa Lima & Ferreira, 1963: 431).

Reference. World revision: Burks (1958: 22–26); revision African species: Annecke (1968: 250–258).

Distribution. Brazil, Trinidad, St Vincent. World: cosmopolitan.

Biology. Polyembryonic parasites of larvae of Xylocopidae (Hymenoptera) (and also Hylaeidae in other parts of the world).

Comments. Placed in the tribe Copidosomatini, subtribe Coelopencyrtina.

COMPERIA Gomes

(Key couplets: ♀ 65; ♂ 27)

Comperia Gomes, 1942: 41. Type-species: *Dicarnosis merceti* Compere, by monotypy.

Included species. Seven, one of which is found in the Neotropics: *merceti* (Compere, 1938: 317).

Reference. Key to world species: Prinsloo & Annecke (1978: 315–316).

Distribution. Throughout the Neotropics. World: Nearctic region, African continent, Australia.

Biology. Parasites of cockroach oothecae (Orthoptera: Blattodea).

Comments. Placed in the tribe Comperiini.

COMPERIELLA Howard

(Key couplets: ♀ 47; ♂ 137)

Comperiella Howard, 1906: 121. Type-species: *Comperiella bifasciata* Howard, by monotypy.
Pseudanusia Girault, 1915*d*: 155. Type-species: *Pseudanusia pia* Girault, by monotypy.
Habrolepistia Mercet, 1921: 668. Type-species: *Habrolepistia cerapterocera* Mercet, by monotypy.

Included species. Nine, one of which is from the Neotropics: *bifasciata* Howard (= *Habrolepistia cerapterocera* Mercet, 1921: 669).

Distribution. Argentina, Chile, Mexico, Bermuda. World: cosmopolitan.

Biology. Parasites of Diaspididae (Homoptera).

Comments. Placed in the tribe Habrolepidini, subtribe Comperiellina.

COPIDOSOMA Ratzeburg

(Key couplets: ♀ 155, 173, 201, 253; ♂ 77. Figs 69, 97, 105, 107, 109)

Copidosoma Ratzeburg, 1844: 157. Type-species: *Copidosoma boucheanum* Ratzeburg, by monotypy.
Verdunia Mercet, 1917*b*: 203. Type-species: *Verdunia gloriosa* Mercet, by monotypy.
Neocopidosoma Ishii, 1923: 101. Type-species: *Neocopidosoma komabae* Ishii, by monotypy.
Arrenoclavus Doutt, 1948: 145. Type-species: *Copidosoma koehleri* Blanchard, by monotypy.

Included species. Eighty-one, five of which are from the Neotropics: *desantisi* Annecke & Mynhardt, 1974: 32, *hyalinistigma* De Santis, 1964: 281, *koehleri* Blanchard (Annecke & Mynhardt, 1974: 32), *silvestrii* (Costa Lima, 1956: 31) (**comb. n.** from *Paralitomastix*) and *virescens* De Santis, 1972*b*: 57, also a further six undetermined species from Brazil and West Indies (BMNH; CNC, Ottawa).

Distribution. Throughout the Neotropics. World: cosmopolitan.

Biology. Polyembryonic parasites of larvae of Lepidoptera.

Comments. Placed in the tribe Copidosomatini, subtribe Copidosomatina. All the genera in this subtribe are extremely close. *Litomastix* and *Pentalitomastix* both usually have a strongly, obliquely truncate clava (sometimes more rounded on ventral surface than obliquely truncate) whereas all the other genera have the apex of the clava transversely, or very slightly obliquely, truncate or rounded. The latter can be separated using the characters given in the key.

***CYDERIUS* gen. n.**

(Key couplets: ♀ 187. Fis 92, 159)

Type-species: *Cyderius urbicola* sp. n.

♀. *Head.* In profile, moderately deep and most rounded at level with top of antennal scrobes, frontovertex slightly convex. Eye slightly longer than broad, with sparse, short pale hairs and very nearly reaching occipital margin which is acute. Malar space about half length of eye with malar sulcus weakly indicated. Frontovertex about one-third head width; posterior ocellus separated from eye and occipital margin by about half its diameter, ocelli forming an acute angle of about 75°. Antennal scrobes moderately deep, meeting dorsally and reaching slightly further than half way between antennal toruli and anterior ocellus; antennal torulus separated from mouth margin by slightly less than its own length and from other torulus by nearly one and a half times its own length, dorsal margin of torulus slightly below ventral level of eyes; scape subcylindrical and stout, pedicel conical and about as long as first funicle segment, funicle six-segmented, all segments distinctly longer than broad, except the second which is anelliform, clava three-segmented, about half as long as funicle and with apex more or less rounded; longitudinal sensilla very conspicuous and present on all flagellar segments except second. Mouth opening narrow, slightly narrower than minimum width of frontovertex. Frontovertex with shallow, reticulate sculpture, more elongate and coriaceous on lower parts of face. Mandibles with three acute teeth.

Thorax. In side view moderately deep, with mesoscutum and scutellum more or less flat. Mesoscutum without notaular lines, nearly twice as broad as long, axillae meeting, scutellum about as broad as long with apex pointed and produced as a short thin flange, propodeum medially about one-eighth as long as scutellum. Pronotum, mesoscutum and axillae with shallow coriaceous sculpture, scutellum with deeper, reticulate sculpture which becomes shallower, more irregular and elongate towards sides and apex, mesopleura almost smooth with very shallow, elongate, reticulate sculpture. Forewing hyaline, about two and a half times as long as broad; basal cell sparsely pilose throughout except for a small, naked, triangular area proximally, speculum not interrupted but more or less closed; submarginal vein with an apical hyaline break, marginal vein slightly longer than broad, about twice as long as postmarginal and about half as long as stigmal. Hindwing about four and a half times as long as broad. Mid tibial spur nearly as long as corresponding basal tarsal segment.

Gaster. About as long as thorax, with exserted part of ovipositor about one-fifth length of gaster or one-quarter mid tibia, cerci about three-eighths along gaster, apex of hypopygium not reaching half way along gaster.

♂. Unknown.

***Cyderius urbicola* sp. n.**

(Figs 92, 159)

♀. Length (excluding ovipositor): 0·73 mm.

Colour. Head and thorax dark brown and shiny; scape testaceous, pedicel and flagellum brown; some orange areas along top of antennal scrobes just above interantennal prominence to outer margins of toruli and from there to lower margin of eye (these may represent lines of weakness in head capsule); legs completely yellow; gaster dark brown, basally and medially orange-brown, ventrally orange; ovipositor sheaths orange-brown.

Head. Relative measurements of head: maximum width 58, frontovertex width at median ocellus 22·5, malar space about 20, eye length 35, eye width 29, POL 9, OOL 2·5, scape length 28, other proportions of antenna as in Fig. 92.

Thorax. Relative measurements of forewing (Fig. 159): length 164, maximum width 63, length of submarginal vein 66, marginal vein 6, stigmal vein 13, postmarginal 3; of hindwing: length 108, maximum width 23.

♂. Unknown.

DISTRIBUTION. Trinidad.

BIOLOGY. Unknown.

MATERIAL EXAMINED

Holotype ♀, **Trinidad**: St George, St Augustine, 15.vii.–13.viii.1976, Malaise trap (*J. S. Noyes*) (BMNH).

COMMENTS. I am unable to place this genus according to Trjapitzin's (1973*b*) classification of the Encyrtinae, although the wings and the structure of the thorax suggest that it may be related to *Archinus* and *Cicoencyrtus* which probably belong in the tribe Aphycini, subtribe Paraphycina. It can easily be separated on the unusual form of the antenna i.e. all segments longer than broad, except the second which is anelliform, and also the presence of an apical flange on the scutellum.

DELOENCYRTUS De Santis

(Key couplets: ♀ 104, 150)

Deloencyrtus De Santis, 1967*a*: 68. Type-species: *Hemencyrtus kuscheli* De Santis, by monotypy.

INCLUDED SPECIES. One: *kuscheli* (De Santis, 1955: 193).

DISTRIBUTION. Juan Fernández Island, Chile.

BIOLOGY. Unknown.

COMMENTS. Very probably belongs to the tribe Microteryini, and possibly subtribe Pseudencyrtina.

DESANTISELLA Subba Rao

(Key couplets: ♀ 124; ♂ 31. Fig. 61)

Desantisella Subba Rao, 1971: 215. Type-species: *Desantisella brasiliensis* Subba Rao, by original designation.

INCLUDED SPECIES. Three: *brasiliensis* Subba Rao, 1971: 216, *plaumanni* Subba Rao, 1971: 218 and *trifasciata* De Santis, 1972*a*: 22.

DISTRIBUTION. Brazil.

BIOLOGY. Hyperparasites of Chamaemyiidae (Diptera) on Aclerdidae (Homoptera).

COMMENTS. Extremely close to *Meromyzobia* (tribe Miraini, subtribe Mayridina) and differs only in the form of the mid tibial spur (*Meromyzobia* has the mid tibial spur of normal encyrtid form). I think it very likely that the two genera will eventually be considered synonymous, but I hesitate to formally synonymize them here because material of *Ericydnus maculipennis* (type-species of the genus) has not been seen although I have examined some material from Florida which very probably belongs to this genus.

DESOBIUS gen. n.

(Key couplets: ♀ 86, 229; ♂ 26. Figs 119, 160–163)

Type-species: *Desobius convexus* sp. n.

♀. *Head*. In profile, moderately deep and more or less evenly curved. Eye about a half longer than broad with conspicuous long setae, and reaching occipital margin which is sharp. Malar space about half eye length and with malar sulcus present. Frontovertex about one-quarter to one-half head width and with numerous long dark setae; posterior ocellus separated from occipital margin by less than to slightly more than its own diameter and from eye margin by much less than its own diameter, ocelli forming an acute angle of about 60°. Antennal scrobes moderately impressed, meeting dorsally and reaching about half way from antennal toruli to anterior ocellus; antennal torulus separated from mouth margin by about its own length and from other torulus by nearly twice its own length and with dorsal margin below lowest margin of eye; scape subcylindrical or very slightly broadened and flattened with several strong, dark bristles along ventral margin, pedicel conical and slightly less than half as long as funicle, funicle six-segmented, all segments transverse (mostly anelliform) except perhaps the last which may be subquadrate, clava very large, longer and broader than funicle, three-segmented, apically rounded or with a short oblique truncation; longitudinal sensilla on sixth funicle segment and clava only. Frontovertex usually appearing fairly smooth and shiny, but with shallow coriaceous sculpture which becomes more elongate and of larger mesh on cheeks and lower parts of face, occasionally sculpture deeper and therefore frontovertex less shiny. Mandibles with three acute teeth, the middle the longest, maxillary palpi four-segmented, labial palpi three-segmented.

Thorax. Deep in side view and dorsally convex. Mesoscutum convex and without notaular lines, about a half broader than long, axillae not meeting centrally, scutellum very convex, longer than broad, propodeum medially from about one-sixth to one-tenth as long as scutellum. Scutellum with very inconspicuous tubercles or pits like those found in *Forcipestricis*. Mesoscutum and scutellum with deep, longitudinally semi-striate or strigose sculpture, matt, axillae with deep reticulate-coriaceous sculpture, mesopleura with irregular shallow sculpture, propodeum smooth medially. Forewing hyaline with some slight infumation basally and beneath marginal vein, about two and a half times as long as broad; basal cell with sparse setae throughout except a large naked area proximally, speculum not interrupted and open; submarginal vein with an apical hyaline break, marginal vein about three or four times as long as broad, slightly shorter than stigmal and about as long as postmarginal. Hindwing about four and a half times as long as broad. Mid tibial spur slightly shorter than corresponding basal tarsal segment.

Gaster. Slightly shorter than thorax. Cerci in basal third, paratergites absent, apex of hypopygium nearly reaching apex of gaster. Ovipositor hidden or very slightly protruding, ovipositor short, only slightly longer than half of gaster or about three-fifths to three-quarters length of mid tibia, gonostylus about as long as mid tibial spur.

♂. Essentially similar to female except the frontovertex is less smooth and therefore less shiny, antennae (Fig. 119) and genitalia (Fig. 161), digiti each with an apical spine and aedeagus slightly less than two-fifths as long as mid tibia. Antennae with flagellum, in some cases having seven-segmented funicle with a one- or two-segmented clava, or in others the funicle is six-segmented with a two- or three-segmented clava. In dry specimens the clava always appears two- or three-segmented, but in cleared slide mounted material the division of the apical segment into two is incomplete or only indicated by a slight thinning of cuticle and distribution of sensillae. Longitudinal sensilla very conspicuous (even on dry mounted material) and present on all flagellar segments.

Desobius convexus sp. n.

(Figs 160, 162, 163)

♀. Length: 0·78–0·86 mm (holotype 0·78 mm).

Colour. Head, dorsum of thorax, propodeum and gaster black, frontovertex and cheeks shiny with faint blue or purple sheen, dorsum of thorax matt, gaster dorsally with some brassy, blue and purple reflections; antenna with scape testaceous, pedicel and clava brown, funicle brownish testaceous; mesopleura and legs pale orange, fore and hind legs, except coxae, mixed brown, particularly fore femora and tibiae and hind femora.

Head. Apex of clava with an indistinct oblique truncation which is much shorter than ventral margin of clava (Fig. 160); posterior ocellus separated from occipital margin by slightly more than half its major diameter; frontovertex fairly smooth with shallow coriaceous sculpture. Relative measurements of head of holotype: maximum head width 48, width of frontovertex at median ocellus 12·5, malar space 19, eye length 34, eye width 26, POL 6, OOL 2, scape length 20, other proportions of antenna as in Fig. 160.

Thorax. Relative measurements of forewing of holotype: length 134, maximum width 55, length of submarginal vein 51, of marginal vein 6, of stigmal vein 8, of postmarginal vein 6. Base of forewing as in Fig. 163.

Gaster. Exserted part of ovipositor about half length of mid tibial spur. Relative measurements of gaster of paratype: length of ovipositor 33, length of gonostylus 13 [mid tibia 51, mid tibial spur 13].

♂. Unknown.

DISTRIBUTION. Trinidad.

BIOLOGY. Unknown.

MATERIAL EXAMINED

Holotype ♀, **Trinidad**: St George, El Tucuche (S. slope), 25.vii.1976 (*J. S. Noyes*) (BMNH).
Paratype. 1 ♀, same data as holotype (BMNH).

COMMENTS. The genus also includes *Desobius sylvicola* (De Santis, 1967*a*: 71) (**comb. n.** from *Tyndarichus*) from Argentina. I have also examined a possible ten further undescribed species from Trinidad, St Vincent (BMNH), Ecuador, Brazil and Panama (CNC, Ottawa), differing in the sculpture of the frontovertex, relative positions of ocelli, proportions of antennal segments, length of exserted part of ovipositor and coloration. The genus also occurs in India and possibly in Europe (*Coccidencyrtus pinicola* Mercet and *Parageniaspis montana* Mercet may belong here) and Australia. See comments under *Amaurilyma*.

DICARNOSIS Mercet

(Key couplet: ♀ 64)

Dicarnosis Mercet, 1921: 141. Type-species: *Dicarnosis superbus* Mercet, by monotypy.

Neither *blanchardi* De Santis, 1972*b*: 48 nor *ogloblini* De Santis, 1972*b*: 48 are correctly placed here, although originally described in *Dicarnosis*: *D. ogloblini* belongs to *Metaphycus* and *blanchardi* very probably belongs to an undescribed genus near *Metaphycus*.

DIVERSINERVUS Silvestri

(Key couplets: ♀ 56; ♂ 64, 103)

Diversinervus Silvestri, 1915*a*: 301. Type-species: *Diversinervus elegans* Silvestri, by monotypy.
Cheiloneuroides Girault, 1915*d*: 96. Type-species: *Cheiloneuroides bicristatus* Girault, by monotypy.

INCLUDED SPECIES. Ten, one of which is found in the Neotropics: *elegans* Silvestri.

REFERENCE. Key to world species: Hayat, Alam & Agarwal (1975: 39–41).

DISTRIBUTION. Brazil, Peru. World: cosmopolitan.

BIOLOGY. Parasites of Coccidae (Homoptera).

COMMENTS. Placed in the tribe Cheiloneurini.

ECHTHRODRYINUS Perkins

(Key couplets: ♀ 206, 257; ♂ 122, 145. Fig. 91)

Echthrodryinus Perkins, 1906: 252. Type-species: *Echthrodryinus destructor* Perkins, by monotypy.

INCLUDED SPECIES. Six, one of which is from the Neotropics: *saccharalis* Gordh & Trjapitzin; also a further four or five undetermined species from Trinidad, Brazil and Guyana (BMNH; CNC, Ottawa).

Reference. Revision: Gordh & Trjapitzin (1978).

Distribution. Venezuela, Brazil, Trinidad, Guyana. World: cosmopolitan.

Biology. Hyperparasites via other parasitic Hymenoptera (mainly Dryinidae and Braconidae).

Comments. Two of the undetermined species that I have included in this genus are perhaps atypical; one is very common in South America and has been reared solely from syrphid (Diptera) puparia, the other has the thorax exceptionally deep and the body very squat. The former is best placed in the present genus even though the stigmal vein forms a slightly greater angle with the postmarginal vein than is usual for this genus.

Placed in the tribe Microteryini, subtribe Syrphophagina. Some species of this genus strongly resemble some species of *Ooencyrtus* and *Syrphophagus*. It can best be separated from the latter by the relative length of the scutellum (see key), and from the former by the much longer postmarginal vein and more strongly clavate antennae.

ECHTHROPLEXIELLA Mercet

(Key couplet: ♂ 32)

Echthroplexiella Mercet, 1921: 183. Type-species: *Echthroplexiella submetalica* Mercet, by original designation.

Included species. Twenty, one of which is found in the Neotropics: *josephi* De Santis, 1965: 4.

Distribution. Argentina. World: Palaearctic region.

Biology. Parasites or hyperparasites (via other Encyrtidae) on Eriococcidae (Homoptera).

Comments. I am very doubtful about the generic placement of *josephi*. The unique holotype male is dissected on a slide and may be a brachypterous male *Metaphycus*.

ECTROMA Westwood

(Key couplet: ♀ 38)

Ectroma Westwood, 1833: 344. Type-species: *Ectroma fulvescens* Westwood, by monotypy.
Metallon Walker, 1848: 219. Type-species: *Metallon acacallis* Walker, by monotypy.
Pezobius Förster, 1860: 129. Type-species: *Pezobius polychromus* Förster, by monotypy.

Included species. Eleven, one of which is found in the Neotropics: *semifacta* De Santis, 1972*b*: 52.

Distribution. Argentina. World: Palaearctic region.

Biology. Unknown.

Comments. I have examined the holotype of *semifacta* and it appears to be correctly assigned to *Ectroma*.

Placed in the tribe Miraini, subtribe Mayridiina.

ECTROMATOPSIS Compere

(Key couplets: ♀ 35; ♂ 99)

Ectromatopsis Compere, 1947: 13. Type-species: *Ectroma americanum* Howard, by monotypy.

Included species. One: *americana* (Howard, 1898*b*: 248).

Distribution. Mexico. World: Nearctic region.

Biology. Parasites of Pseudococcidae (Homoptera).

Comments. Very probably best placed in the tribe Anagyrini.

ENCYRTUS Latreille
(Key couplets: ♀ 94; ♂ 62, 73, 87. Figs 49, 136)

Encyrtus Latreille, 1809: 31. Type-species: *Chrysis infida* Rossi, by designation of Latreille (1810: 436).
Eucomys Förster, 1856: 32. Type-species: *Encyrtus swederi* Dalman, by original designation.
Comys Förster, 1856: 144. [Replacement name for *Eucomys* Förster.]
Howardia Dalla Torre, 1897: 86. Type-species: *Bothriothorax peckhami* Ashmead, by monotypy. [Homonym of *Howardia* Berlese, 1896.]
Howardiella Dalla Torre, 1898: 228. [Replacement name for *Howardia* Dalla Torre.]
Allorhopoideus Brèthes, 1916*b*: 425. Type-species: *Allorhopoideus mirabilis* Brèthes, by monotypy.
Prorhopoideus Brèthes, 1921*b*: 80. Type-species: *Prorhopoideus baezi* Brèthes, by monotypy.

INCLUDED SPECIES. Ninety-five, most of which are probably incorrectly placed, eight from the Neotropics: *baezi* (Brèthes), *bicolor* (Howard), *haywardi* De Santis, *infelix* (Embleton, 1902: 223), *lecaniorum* (Mayr), *littoralis* (Blanchard), *mexicanus* (Girault, 1917*b*: 21), *vianai* De Santis; also a further two undetermined species from Venezuela and Brazil (BMNH).

REFERENCE. Revision of species from Argentina: De Santis (1964: 314–332).

DISTRIBUTION. Throughout the Neotropics. World: cosmopolitan.

BIOLOGY. Parasites of Coccidae (Homoptera).

COMMENTS. Placed in the tribe Encyrtini.

Encyrtus conformis Howard
(Key couplet: ♀ 180)

Encyrtus conformis Howard, 1897: 152.

I am unable to place this species, although it may be close to *Exoristobia*, but differs in the eyes being naked, the scutellum much more convex and the propodeum relatively longer. For redescription of species see Noyes (1979: 152–154).

Encyrtus quadricolor Howard

Encyrtus quadricolor Howard *in* Riley, Ashmead & Howard, 1894: 93.

Type lost. The description may refer to a male *Rhytidothorax* which has lost the conspicuous setae on the frontovertex or perhaps a male *Habrolepoidea*. The species may be recognizable if further material is collected in St Vincent, but until that time the name should be considered a nomen dubium.

EPIENCYRTUS Ashmead
(Key couplets: ♀ 137, 241. Fig. 101)

Epiencyrtus Ashmead, 1900: 396. Type-species: *Encyrtus thyreodontis* Ashmead, by original designation.

INCLUDED SPECIES. Two, one an undetermined species from Panama (CNC, Ottawa).

DISTRIBUTION. Panama. World: Nearctic region.

BIOLOGY. Hyperparasite of other Encyrtidae parasitic in larvae of Lepidoptera.

COMMENTS. Placed in the tribe Cheiloneurini, subtribe Epiencyrtina. For key to related genera see Trjapitzin & Gordh (1978*b*).

ERICYDNUS Walker
(Key couplets: ♀ 116; ♂ 67. Fig. 53)

Ericydnus Walker, 1837: 363. Type-species: *Ericydnus paludatus* Walker, by designation of Westwood (1840: 72).

Grandoriella Domenichini, 1951: 171. Type-species: *Grandoriella lamasi* Domenichini, by monotypy. **Syn. n.**

Included species. Thirteen, one of which is found in the Neotropics: *lamasi* (Domenichini, 1951: 173) (**comb. n.**).

Reference. World revision: Kerrich (1967: 166–180).

Distribution. Peru, Panama. World: cosmopolitan.

Biology. Parasites of Pseudococcidae (Homoptera).

Comments. I do not consider the differences between *Grandoriella* and *Ericydnus* warrant separate generic status. The Australian species belonging to this genus are intermediate between the two genera.

Placed in the tribe Ericydnini (*Grandoriella* is placed in a separate tribe of its own by Trjapitzin (1973*a*), i.e. Grandoriellini).

EURYRHOPALUS Howard

(Key couplets: ♀ 142, 250; ♂ 17)

Euryrhopalus Howard, 1898*b*: 237. Type-species: *Euryrhopalus schwarzi* Howard, by monotypy.
Synaspidia Timberlake, 1924: 397. Type-species: *Synaspidia pretiosa* Timberlake, by monotypy.

Included species. Nine, four of which are found in the Neotropics: *kirkpatricki* (Kerrich), *pretiosus* (Timberlake), *propinquus* Kerrich, *pulchrior* Kerrich.

Reference. World revision: Kerrich (1967: 235–246).

Distribution. Mexico, Guatemala, Jamaica, Trinidad, Guyana, Panama, Colombia. World: Nearctic region and Hawaii.

Biology. Parasites of Pseudococcidae (Homoptera).

Comments. Placed in the tribe Neodiscodini.

EXORISTOBIA Ashmead

(Key couplets: ♀ 85, 204, 256. Figs 167–169)

Exoristobia Ashmead, 1904*b*: 15. Type-species: *Exoristobia philippinensis* Ashmead, by monotypy.

Included species. Three, none of which is found in the Neotropics, but three undetermined species from Trinidad and St Vincent (BMNH).

Reference. Revision: Subba Rao (1970).

Distribution. Trinidad, St Vincent. World: Oriental, Australian and Ethiopian regions.

Biology. Parasites of Syrphidae and Tachinidae (Diptera).

Comments. *Encyrtus conformis* Howard may also belong to *Exoristobia*, but differs in having a rather more convex scutellum and relatively longer propodeum. The species from the Neotropics differ from the other known species in having relatively longer funicle segments.

I am unable to place the genus according to Trjapitzin's (1973*b*) classification of the Encyrtidae.

FORCIPESTRICIS Burks

(Key couplets: ♀ 227, 237, 239; ♂ 30, 91, 109. Figs 98, 99)

Forcipestricis Burks, 1968: 237. Type-species: *Forcipestricis gaseaui* Burks, by monotypy.

Included species. Three, two of which are found in the Neotropics: *portoricensis* Gordh (1975: 239), *sordidus* (Howard, 1897: 153); also at least a further 25 undetermined species from the West Indies, Brazil and Ecuador (BMNH; CNC, Ottawa).

DISTRIBUTION. Puerto Rico, Brazil, Ecuador, West Indies. World: Nearctic region.

BIOLOGY. Parasites of Ceratopogonidae (Diptera).

COMMENTS. Apparently a large and taxonomically difficult genus. The presence of the tubercles or pits on the scutellum (Figs 98, 99) seems fairly unique in the Encyrtidae, although they are present in the probably unrelated genera *Amaurilyma* and *Desobius*. The pits in these two genera are very difficult to see, even on slide mounted material, whereas those of *Forcipestricis* can be seen, with practice, on dry mounted material. Useful characters for separating the species into groups are: number of teeth in mandibles (bi- or tridentate), scutellum flat or convex, scutellum with sculpture or smooth and distribution of pits i.e. grouped or scattered.

The genus cannot be placed according to Trjapitzin's (1973*b*) classification of the Encyrtidae.

GAHANIELLA Timberlake

(Key couplets: ♀ 68, 79, 166, 196; ♂ 108. Fig. 37)

Gahaniella Timberlake, 1926: 23. Type-species: *Gahaniella californica* Timberlake, by original designation.

INCLUDED SPECIES. Three, all from the Neotropics: *californica* Timberlake, *saissetiae* Timberlake and *tertia* Kerrich.

REFERENCE. Kerrich (1953: 800–802).

DISTRIBUTION. Argentina, Brazil, Uruguay, Cuba, Trinidad, Virgin Islands. World: Nearctic region.

BIOLOGY. Hyperparasites via other Encyrtidae in Coccidae and Pseudoccidae, possibly also primary parasites of Coccidae (Homoptera).

COMMENTS. Placed in the tribe Microteryini by Trjapitzin & Gordh (1978*b*).

GONZALEZIA De Santis

(Key couplets: ♀ 179, ♂ 90)

Gonzalezia De Santis, 1964: 292. Type-species: *Gonzalezia gloriosa* De Santis, by monotypy.

INCLUDED SPECIES. One: *gloriosa* De Santis, 1964: 294.

DISTRIBUTION. Argentina.

BIOLOGY. Unknown.

COMMENTS. Very similar to *Cerchysius* and *Aseirba* from which it can easily be separated using the characters given in the key, notably the relatively small eyes.

I am unable to place the genus according to Trjapitzin's (1973*b*) classification of the Encyrtidae.

GRISSELLIA gen. n.

(Key couplets: ♀ 202, 247; ♂ 143. Figs 104, 110, 164–166)

Type-species: *Grissellia terebrata* sp. n.

♀. *Head.* In side view moderately deep, most rounded level with top of antennal scrobes, frontovertex slightly convex. Eye slightly longer than broad with short inconspicuous pale hairs and overreaching occipital margin which is rounded. Malar space slightly more than half to three-fifths length of eye with malar sulcus weakly indicated. Frontovertex, at narrowest point, about one-quarter of head width, ocelli forming an acute angle of about 60 °, posterior ocellus separated from occipital margin by about one and a half times to twice its own diameter and from eye margin by less than half its own diameter. Centre of clypeus sometimes slightly produced downwards and outwards. Antennal scrobes moderately deep, fairly long and joined dorsally, their uppermost point slightly more than half way between antennal toruli and anterior ocellus, interantennal prominence dorsally rounded and about one and a half times as long as a torulus, antennal torulus separated from mouth margin by about half its own length and from other torulus by about one and a half times its own length, dorsal margin slightly lower than lowest eye margin; scape subcylindrical or slightly expanded and flattened in middle, pedicel conical, longer than first two funicle segments together, funicle six-segmented with segments cylindrical and distinctly transverse to longer than broad, gradually broadening apically, clava three-segmented with apex rounded, slightly broader than and more than half as long as funicle; longitudinal sensilla on fifth and sixth funicle segments and clava. Frontovertex with punctiform-reticulate sculpture between ocelli gradually becoming shallower and more irregular towards top of antennal scrobes, cheeks with longitudinally elongate coriaceous sculpture but quite smooth immediately below eyes, antennal scrobes smooth and polished. Mandibles with one or two acute teeth and a truncation, maxillary palpi four-segmented, labial palpi three-segmented.

Thorax. Moderately deep in side view with mesoscutum and scutellum flat. Mesoscutum without notaular lines, about one half broader than long, axillae separated by posterior margin of mesoscutum, scutellum dorsally flat and slightly broader than long, propodeum centrally less than one-eighth as long as scutellum. Pronotum, mesoscutum and axillae with coriaceous sculpture, scutellum with deep punctate-reticulate sculpture, sides and extreme apex smooth, mesopleuron with shallow, irregularly elongate sculpture, propodeum smooth. Forewing hyaline, slightly more than twice as long as broad; basal cell sparsely hairy in distal half, naked proximally, speculum open and not interrupted; submarginal vein with an apical hyaline break, marginal vein about twice as long as broad, slightly longer than or about as long as postmarginal and about half as long as stigmal. Hindwing about four times as long as broad. Mid tibial spur nearly as long as mid basal tarsal segment.

Gaster. About as long as thorax, cerci at about one-third, apex of hypopygium reaching to about one-half to two-thirds along gaster, paratergites absent, epipygium occasionally with apex very acute and overhanging base of ovipositor as in *Pseudencyrtus*, exserted part of ovipositor from one-seventh to one-third as long as gaster. Ovipositor about one and a half to three times as long as mid tibia, gonostylus about two-fifths to as long as mid tibia.

♂. Differs from female as follows: antennal scrobes nearly reaching anterior ocellus, antennae as in Fig. 165, frontovertex at narrowest point slightly less than one half of head width, scutellum slightly convex and gaster shorter than thorax. The genitalia are unknown since the only available male is dry mounted.

Named in honour of Dr E. E. Grissell.

Grissellia terebrata sp. n.
(Figs 104, 110, 164, 166)

♀. Length (excluding ovipositor): 1·24–1·43 mm (holotype 1·37 mm).

Colour. Head, thorax (except scutellum) and gaster generally dark brown with slight blue, green and brassy reflections, antennal scrobes and cheeks with stronger purple or blue reflections. Antennae with scape dark brown, paler apically and with some metallic green reflections, pedicel basally dark brown, apex of pedicel and flagellum pale brown; scutellum dark green, sculptured area matt and with some brassy reflections, smoother areas shiny and tinged blue; legs with coxae, femora and tibiae brown with apices of tibiae and tarsi yellow; basal tergite of gaster metallic blue-green, ovipositor sheaths dark brown.

Head. Centre of clypeus very slightly produced outwards and downwards; mandibles with two teeth and a truncation (Fig. 104). Relative measurements of head of holotype: maximum head width 67, frontovertex width at median ocellus 18, malar space 25, eye length 41, eye width 35, POL 8, OOL 2, scape length 30, other proportions of antennae as in Fig. 164.

Thorax. Relative measurements of forewing of holotype: length 172, maximum width 76, length of submarginal vein 70, of marginal vein 5, of stigmal vein 10, of postmarginal vein 5; of hindwing: length 117, maximum width 29. Base of forewing as in Fig. 110.

Gaster. Slightly longer than thorax, epipygium very elongate and very acute, apex of hypopygium reaching to about two-thirds along gaster, exserted part of ovipositor about one-third as long as gaster. Relative measurement of paratype: ovipositor length 158, gonostylus length 62 [mid tibia length 59]. Ovipositor as in Fig. 166.

♂. Unknown.

Distribution. Brazil.

Biology. Unknown.

Material examined

Holotype ♀. **Brazil**: Santa Catarina, Nova Teutonia, 15.x.1949 (*F. Plaumann*) (BMNH).
Paratypes. **Brazil**: 2 ♀, Nova Teutonia, 17.x.1949, 20.x.1949 (*F. Plaumann*) (BMNH).

Comments. Two additional undescribed species from Brazil and St Vincent (BMNH), also an undescribed species from India (BMNH).

The genus is very close to *Echthrodryinus* and *Ooencyrtus* (tribe Microteryini) but differs from both in having a flat scutellum with punctate sculpture and exserted ovipositor, and from *Ooencyrtus* in having a long postmarginal vein. In both *Echthrodryinus* and *Ooencyrtus* the scutellum is rather evenly convex (except perhaps in *Ooencyrtus chrysopae* where the scutellum appears to be flat, but this may be due to the scutellum collapsing as a result of the small size of this species), and rarely with punctate sculpture, the ovipositor is usually hidden, although sometimes slightly exserted, and in *Ooencyrtus* the postmarginal vein is short or absent.

GYRANUSOIDEA Compere

(Key couplets: ♀ 70; ♂ 96)

Gyranusoidea Compere, 1947: 17. Type-species: *Gyranusa citrina* Compere, by monotypy.

Included species. Ten, none from the Neotropics, but two undetermined species from Brazil and Trinidad (BMNH).

Distribution. Brazil, Trinidad. World: Hawaii, Africa, India, Australia.

Biology. Parasites of Pseudococcidae (Homoptera).

Comments. Placed in the tribe Anagyrini, subtribe Anagyrina. Close to *Anagyrus* and probably should be considered synonymous. See 'Comments' under *Anagyrus*.

HABROLEPIS Förster

(Key couplets: ♀ 53; ♂ 7. Fig. 32)

Habrolepis Förster, 1856: 34. Type-species: *Encyrtus nubilipennis* Walker, by original designation.
Gymnoneura Risbec, 1951: 157. Type-species: *Gymnoneura bambeyi* Risbec, by monotypy.

Included species. Twenty-one, two of which are found in the Neotropics: *dalmanii* (Westwood), *rouxi* Compere.

Reference. Annecke & Mynhardt (1970: 128–146).

Distribution. Chile, Bermuda. World: cosmopolitan.

Biology. Parasites of Diaspididae and Asterolecaniidae (Homoptera).

Comments. Placed in the tribe Habrolepidini, subtribe Habrolepidina.

HABROLEPOIDEA Howard

(Key couplet: ♀ 227)

Habrolepoidea Howard *in* Riley, Ashmead & Howard, 1894: 89. Type-species: *Habrolepoidea glauca* Howard, by monotypy.

Included species. Six, two of which are found in the Neotropics: *glauca* Howard (Noyes, 1979: 157), *celia* Girault, 1917*b*: 22.

Distribution. St Vincent.

Biology. Unknown.

COMMENTS. The species described under *Habrolepoidea* by Girault from North America and Australia are very probably incorrectly placed. Girault (1920: 187) synonymized *Zarhopaloides* Girault with *Habrolepoidea* but from the description of the type-species this is evidently incorrect. I have not seen the type of *celia*.

I am unable to place the genus satisfactorily according to Trjapitzin's (1973*b*) classification of the Encyrtidae, but it may belong to the Microteryini.

HAMBLETONIA Compere

(Key couplets: ♀ 51; ♂ 18. Figs 29, 31, 116, 118)

Hambletonia Compere, 1936: 172. Type-species: *Hambletonia pseudococcina* Compere, by monotypy.

INCLUDED SPECIES. One: *pseudococcina* Compere, 1936: 173.

DISTRIBUTION. Brazil, Argentina, Colombia, Puerto Rico, West Indies. World: Nearctic region, Hawaii.

BIOLOGY. Parasites of Pseudococcidae (Homoptera).

COMMENTS. Placed in the tribe Chrysoplatycerini, subtribe Chrysoplatycerina (Trjapitzin & Gordh, 1978*b*: 648).

HELEGONATOPUS Perkins

(Key couplets: ♀ 176; ♂ 15, 118. Figs 114, 140)

Helegonatopus Perkins, 1906: 257. Type-species: *Helegonatopus pseudophanes* Perkins, by monotypy.
Schedioides Mercet, 1919*a*: 96. Type-species: *Schedioides formosus* Mercet, by monotypy.
Hazmburkia Hoffer, 1954: 172. Type-species: *Hazmburkia dimorpha* Hoffer, by monotypy.
Masencyrtus Hoffer, 1960: 98. Type-species: *Masencyrtus concupiens* Hoffer, by monotypy.
Paludencyrtus Hoffer, 1965: 16. Type-species: *Paludencyrtus nikolskajae* Hoffer, by monotypy.

INCLUDED SPECIES. Twelve, one of which is found in the Neotropics: *pseudophanes* Perkins, 1906: 257, also one undescribed species from Trinidad (BMNH).

REFERENCE. Szelenyi (1972: 349–352).

DISTRIBUTION. Argentina, Trinidad, St Vincent, Jamaica. World: cosmopolitan.

BIOLOGY. Hyperparasites of Auchenorrhyncha (Homoptera) via Dryinidae (Hymenoptera).

COMMENTS. Placed in the tribe Chalcerinyini.

HELMECEPHALA gen. n.

(Key couplets: ♀ 81, 185; ♂ 112. Figs 88, 170–173)

Type-species: *Helmecephala albisetosa* sp. n.

♀. *Head*. In profile moderately deep and with frontovertex and face evenly rounded, except for lower parts of face (below ventral eye margin) which is flat. Eye slightly longer to one-third longer than broad, naked and dorsally reaching occipital margin which is sharply marginal to base of mandibles. Malar space about two-thirds length of eye and with malar sulcus absent. Frontovertex at narrowest point slightly more than one-third head width, ocelli forming an acute angle of about 50–85°, posterior ocellus separated from occipital margin by about its own diameter and almost touching inner eye margin. Antennal scrobes shallow and V-shaped, meeting dorsally, not reaching half way from antennal toruli to anterior ocellus and shiny, antennal torulus separated from mouth margin and from other torulus by half its own length, its dorsal margin below lowest level of eyes by about its own length; scape subcylindrical or slightly flattened and expanded in middle, pedicel conical, longer than first funicle segment which is longer than broad, funicle six-segmented with segments cylindrical, becoming shorter and broader distally so that distal segments are distinctly transverse, clava three-segmented, longer than half length of funicle and with a long oblique truncation; longitudinal sensilla on all flagellar segments. Frontovertex, face and cheeks with deep thimble-punctured sculpture, punctures mostly separated by less than their own diameters and shiny bottomed, punctures extending down interantennal prominence to clypeal margin, between punctures rather irregular, raised shallow coriaceous to reticulate sculpture which is usually not very shiny and contrasts rather strongly, in colour and shine, with punctures. Mandibles with two long, narrow, curved, acute teeth and a truncation, occasionally upper tooth shorter and broader, maxillary palpi four-segmented, the apical segment as long or longer than the first three together, labial palpi three-segmented.

Thorax. In side view deep with mesoscutum slightly convex and scutellum moderately convex. Pronotum with strongly concave posterior margin, mesoscutum without notaular lines, less than a half broader than long, axillae slightly separated by posterior margin of mesoscutum, scutellum slightly broader than long and with apex rounded, propodeum short and with spiracles surrounded by dense, appressed, white setae. Pronotum, mesoscutum and axillae with coriaceous sculpture, scutellum with fairly deep, irregular, reticulate sculpture (distinctly deeper than that on mesoscutum) which becomes shallower and of larger mesh towards sides and apex, mesopleura with raised longitudinally strigose sculpture, propodeum more or less smooth but with irregular, shallow sculpture. Forewing hyaline, about two and a half times as long as broad; basal cell completely pilose but with setae in middle very pale and inconspicuous, those towards base and apex rather darker and stronger, costal cell with setae scattered over whole of dorsal surface, speculum closed but not interrupted, extreme apex of wing with cilia absent, marginal cilia along anterior margin very short; submarginal vein without an apical hyaline break, marginal vein about two to three times as long as broad, about as long as stigmal vein and about twice as long as postmarginal. Hindwing about three times as long as broad. Mid tibial spur about as long as mid basal tarsal segment.

Gaster. Slightly shorter than thorax, cerci in basal one-third, paratergites absent, apex of hypopygium reaching about half way along gaster, ovipositor slightly protruding to exserted part, being about one-third as long as gaster, and with sheaths slightly flattened. Ovipositor nearly one and a half times as long as mid tibia, gonostylus about one-third as long as mid tibia.

♂. Essentially same as female except antennal toruli are higher on head, i.e. separated from mouth margin by about one and a half times to twice their own lengths and nearly level with lower eye margins; antennae as in Fig. 170 and genitalia as in Fig. 171; aedeagus slightly longer than mid tibial spur, each digitus with one very strong spine.

Helmecephala albisetosa **sp. n.**
(Figs 88, 172, 173)

♀. Length (excluding ovipositor): 1·70–1·90 mm (holotype 1·70 mm).

Colour. Head dark brownish purple and slightly shiny, thimble-punctures very shiny green, each with a single, slightly flattened white hair arising from it, scape yellowish, pedicel dark brown, yellowish at apex and ventrally, funicle testaceous yellow, dorsally and distally darker, clava and sixth funicle segment brown; pronotum and mesoscutum dark brown with a strong purple shine, mesoscutum covered (except anteriorly) with numerous appressed, white setae, scutellum dark green, purplish in centre, with some bluish reflections, mesopleuron mixed shining blue and purple, propodeum shiny, metallic blue medially; coxae, femora and hind tibia black, knees testaceous, fore and mid tibiae proximally dark brown, gradually becoming testaceous distally, tarsi yellowish white gradually darkening to testaceous distally, mid tibial spur white, brown at apex; gaster black, basal tergite shining greenish blue mixed with some purple.

Head. Ocelli forming an angle at about 75–80°. Relative measurements of head of holotype: head width 99, frontovertex width at median ocellus 36, malar space 45, eye length 61, eye width 51, POL 26, OOL 2, scape length 48, other proportions of antennae as in Fig. 88. There is some variation in the relative length of the scape, from slightly less than to slightly longer than malar space and therefore scape may vary from about four and a half to five times as long as broad.

Thorax. Relative measurements of forewing of holotype: length 204, maximum width 84, length of submarginal vein 85, of marginal vein 10, of stigmal vein 10, of postmarginal vein 5. Base of forewing as in Fig. 172.

Gaster. Exserted part of ovipositor slightly less than one-fifth of gaster or half of mid tibial spur. Relative measurements of gaster of paratype: length of ovipositor 136, of gonostylus 30 [mid tibia length 106]. Genitalia as in Fig. 173.

♂. Unknown.

Distribution. Trinidad.

Biology. Unknown.

Material examined

Holotype ♀, **Trinidad**: Nariva, Ecclesville, 29.vii.1976 (*J. S. Noyes*) (BMNH).

Paratypes. **Trinidad**: 1 ♀, St Andrew, Oropuche, 28.vi.1976; 1 ♀, St George, Aripo Valley, 4.viii.1976; 1 ♀, St Patrick, Bonasse, 12.viii.1976; 2 ♀, St Patrick, Coora, 14.viii.1976; 1 ♀, St George, Tumpuna Reserve, 9.viii.1976 (*J. S. Noyes*); 1 ♀, Curepe, i.1978 (*F. D. Bennett*). (BMNH; CNC, Ottawa; MLP, Argentina.)

Comments. Three further undescribed species from Trinidad (BMNH; CNC, Ottawa) differ in sculpture of frontovertex, coloration of setae on mesoscutum, proportions of antennal segments and relative length of exserted part of ovipositor.

The shape of the head suggests that the nearest relatives to *Helmecephala* are the genera placed in the tribe Prionomasticini (Trjapitzin & Gordh, 1978*b*). This is very probably true, but *Helmecephala* appears to be much less primitive than any of the genera included in this tribe. The cerci are well advanced on the gaster and the dentition of the mandibles is more developed. The venation is also very different, the marginal vein being relatively long and the postmarginal and stigmal veins relatively short. The antennae of the male are also considerably different from those of the males of this tribe.

HEMAENASIUS Ashmead

(Key couplets: ♀ 63, 144, ♂ 92. Figs 51, 59)

Hemaenasius Ashmead, 1900: 374. Type-species: *Hemaenasius confusus* Ashmead, by monotypy.
Epaenasomyia Girault, 1917*c*: 3. Type-species: *Epaenasomyia varicornis* Girault, by monotypy.

Included species. Two, one of which is found in the Neotropics: *confusus* Ashmead, 1900: 374; also one undetermined species from Panama (CNC, Ottawa).

Distribution. Brazil, Panama. World: Nearctic region.

Biology. Unknown.

Comments. Placed in the tribe Discodini, subtribe Hemaenasiina by Trjapitzin & Gordh (1978*b*).

HEMENCYRTUS Ashmead

(Key couplets: ♀ 105, 120, 133, 153, 164, 180, 185, 189; ♂ 104, 108, 112. Fig. 60)

Hemencyrtus Ashmead, 1900: 374. Type-species: *Hemencyrtus herbertii* Ashmead, by monotypy.

Included species. Three: *brasiliensis* (Ashmead) (**comb. n.** from *Bothriothorax*), *casali* De Santis, 1967*a*: 69 and *herbertii* Ashmead, 1900: 375; also a further five or six undetermined species from Trinidad, Brazil, Panama and Ecuador (BMNH; CNC, Ottawa).

Distribution. Argentina, Brazil, Ecuador, Panama, Trinidad.

Biology. Unknown.

Comments. I have examined three syntype females of *Hemencyrtus herbertii*. The one which fits the description best (labelled: 'Aug., Chapada, H. H. Smith coll, Type No. 41381 U.S.N.M.', here designated LECTOTYPE) is lacking wings; of the other two, one is in good condition but fits the description poorly and the other is lacking antennae and one pair of wings. All are congeneric but may not be conspecific.

Bothriothorax brasiliensis (holotype ♂ examined) is best placed in *Hemencyrtus* although it has some characteristics in common with *Zeteticontus*.

The species included in this genus appear to fall into two distinct groups: those where the scutellum is very flat and with a distinct translucent apical flange (includes *herbertii* and *casali*) and those where the scutellum is convex and the flange is distinct or absent (includes *brasiliensis*).

The genus belongs to the tribe Bothriothoracini.

HEXACLADIA Ashmead
(Key couplets: ♀ 112; ♂ 5)

Hexacladia Ashmead, 1891: 456. Type-species: *Hexacladia smithii* Ashmead, by monotypy.
Thysanomastix Perkins, 1907: 55. Type-species: *Thysanomastix koebelei* Perkins, by monotypy.
Sophencyrtus Crawford, 1911: 275. Type-species: *Sophencyrtus townsendi* Crawford, by monotypy.

Included species. Seven, four of which are found in the Neotropics: *blanchardi* De Santis, *mexicana* Girault, *smithii* Ashmead, *townsendi* Crawford; also a further five undescribed species (BMNH; CNC, Ottawa).

Reference. Revision: Burks (1972).

Distribution. Argentina, Brazil, Ecuador, Trinidad. World: Nearctic region.

Biology. Parasites of adult Scutelleridae and Pentatomidae (Heteroptera).

Comments. Placed in the tribe Prionomasticini, subtribe Hexacladiina.

HOMALOPODA Howard
(Key couplets: ♀ 4; ♂ ?7)

Homalopoda Howard *in* Riley, Ashmead & Howard, 1894: 91. Type-species: *Homalopoda cristata* Howard, by monotypy.

Included species. One: *cristata* Howard (Noyes, 1979: 157); also a further four undetermined species (BMNH; CNC, Ottawa; USNM, Washington).

Distribution. Trinidad, St Vincent, Panama.

Biology. Unknown, but probably parasites of Diaspididae (Homoptera).

Comments. Placed in the tribe Habrolepidini, subtribe Habrolepidina.

HOMALOTYLUS Mayr

Homalotylus Mayr, 1876: 752. Type-species: *Encyrtus flaminius* Dalman, by designation of Ashmead (1900: 377).
Nobrimus Thomson, 1876: 116. Type-species: *Encyrtus flaminius* Dalman, by designation of Timberlake (1919*a*: 134).
Mendozaniella Brèthes, 1913: 97. Type-species: *Mendozaniella mirabilis* Brèthes, by monotypy.
Hemaenasoidea Girault, 1916*a*: 307. Type-species: *Hemaenasoidea oculata* Girault, by monotypy.
Lepidaphycus Blanchard, 1936: 13. Type-species: *Lepidaphycus bosqi* Blanchard, by monotypy.
Neoaenasioidea Agarwal, 1966: 71. Type-species: *Neoaenasioidea indica* Agarwal, by monotypy.

Included species. Twenty-eight, seven of which are found in the Neotropics: *brevicauda* Timberlake, *cockerelli* Timberlake, *flaminius* (Dalman), *latipes* Girault, *mexicanus* Timberlake, *mirabilis* (Brèthes), *terminalis* (Say); also a further two undetermined species from Panama and Surinam (BMNH; CNC, Ottawa; CIBC, Trinidad).

Reference. Revision: Timberlake (1919*a*: 133–170).

Distribution. Throughout the Neotropics. World: cosmopolitan.

Biology. Parasites of coccinellid larvae (Coleoptera).

Comments. Placed in the tribe Homalotylini, subtribe Homalotylina.

HOMOSEMION Annecke
(Key couplet: ♀ 49. Fig. 23)

Homosemion Annecke, 1967: 119. Type-species: *Homosemion bennetti* Annecke, by monotypy.

Included species. One: *bennetti* Annecke, 1967: 157.

DISTRIBUTION. Trinidad.

BIOLOGY. Parasites of Margarodidae (Homoptera).

COMMENTS. Placed in the tribe Cerapterocerini.

HOPLOPSIS Destefani
(Key couplet: ♀ 126)

Hoplopsis Destefani, 1889: 140. Type-species: *Hoplopsis mayri* Destefani, by monotypy.

INCLUDED SPECIES. Two, one of which is found in the Neotropics: *cristulata* De Santis, 1972*b*: 56.

DISTRIBUTION. Argentina, Brazil. World: Europe.

BIOLOGY. Unknown.

COMMENTS. Placed in the tribe Microteryini, subtribe Microteryina.

HUNTERELLUS Howard
(Key couplets: ♀ 62, 83; ♂ 71. Figs 34, 132)

Hunterellus Howard, 1908: 241. Type-species: *Hunterellus hookeri* Howard, by monotypy.

INCLUDED SPECIES. Three, one of which is found in the Neotropics: *hookeri* Howard, 1908: 241; also one undetermined species from Trinidad (BMNH).

DISTRIBUTION. Brazil, Trinidad, Puerto Rico, Cuba, Mexico. World: cosmopolitan.

BIOLOGY. Parasites of nymphs of Ixodidae (Acarina).

COMMENTS. Placed in the tribe Ixodiphagini.

ICEROMYIA gen. n.
(Key couplets: ♀ 57, 78; ♂ 103, 135. Figs 38, 44, 174–176)

Type-species: *Iceromyia flavifrons* sp. n.

♀. *Head.* In profile, moderately deep, most rounded level with top of antennal scrobes, frontovertex slightly convex. Eye nearly as broad as long, naked and reaching occipital margin which is sharp. Malar space slightly more than half length of eye, malar sulcus absent. Frontovertex, at narrowest, about one-eighth head width or twice diameter of anterior ocellus, ocelli forming an acute angle, posterior ocellus separated from occipital margin by about its own diameter and more or less touching eye margin. Antennal scrobes fairly deeply impressed, meeting dorsally and reaching about half way between toruli and anterior ocellus, antennal torulus separated from mouth margin by less than its own length and from other torulus by about one and a half times its length, its dorsal margin slightly below lowest margin of eye. Scape broadened and flattened, pedicel conical and about half length of funicle, funicle six-segmented, all segments transverse, lengthening and broadening distally, clava very large, three-segmented, longer than funicle and with a strong, apical oblique truncation; longitudinal sensilla on the apical two or three funicle segments and clava. Frontovertex with shallow coriaceous sculpture. Mandibles with two acute teeth and a truncation, maxillary palpi four-segmented, labial palpi three-segmented.

Thorax. In side view, moderately deep and with mesoscutum and scutellum slightly convex. Mesoscutum without notaular lines, about a half broader than long, axillae more or less touching, scutellum about as long as broad and without apical tuft of setae but with two to six conspicuous longer setae, propodeum medially at most one-seventh as long as scutellum. Pronotum, mesoscutum and axillae with shallow coriaceous sculpture, scutellum with quite deep, longitudinally strigose sculpture tending towards reticulate in centre, mesopleuron with shallow, raised slightly elongate or strigose sculpture, propodeum smooth medially. Forewing hyaline or very slightly infumate in a small triangular area about half way along submarginal vein and across wing from marginal vein and extending to wing apex, becoming slightly paler distally, with a hyaline streak from apex of postmarginal vein to apex of stigmal vein, forewing about two and a half times as long as broad; basal cell more or less naked, but with a few transverse lines of setae distally, speculum not interrupted and open; submarginal vein with an indistinct apical hyaline break, marginal vein slightly more than three times as long as broad, slightly longer than stigmal and about twice as long as postmarginal. Hindwing about four and a half times as long as broad. Mid tibial spur about as long as mid basal tarsal segment.

Gaster. Slightly shorter than thorax. Cerci at about one-third, paratergites absent, apex of hypopygium reaching about half way along gaster, exserted part of ovipositor about half as long as gaster. Ovipositor (Fig. 176) more than one and a half times as long as gaster or about twice as long as mid tibia, gonostylus about as long as mid tibia.

♂. Differs from female as follows: head with antennal scrobes shallower and longer, reaching further than half way between toruli and anterior ocellus, antennal torulus higher on head, separated from mouth margin by more than its own length, its upper margin slightly below lowest level of eye; malar sulcus present; posterior ocellus separated from occipital margin by less than half its diameter, ocelli forming an angle of about 60°, frontovertex nearly one-third head width; antennae as in Fig. 174; sculpture of frontovertex rugose and partly reticulate between ocelli, gradually becoming shallower and coriaceous on lower parts of face and longitudinally strigose on cheeks; forewing completely hyaline with postmarginal vein about as long as stigmal; aedeagus about half as long as mid tibia.

Iceromyia flavifrons sp. n.

(Figs 38, 44, 174, 175)

♀. Length (excluding ovipositor): 1·85 mm.

Colour. Head yellow except for vertex between and behind ocelli and a line across clypeus and lower parts of genae which are dark brown, cheeks with conspicuous, long, dark setae; antenna, except for clava, yellowish orange, clava dark brown; pronotum, axillae and mesoscutum brown with purple, blue, green and brassy reflections, the reflected colour on the mesoscutum depending on angle viewed from; scutellum yellowish orange, more orange apically, propodeum dark orange medially, dark brown laterally, mesopleuron dark brown with purple and blue reflections, mesoscutum with sparse pale brown setae; legs yellow; forewings (Fig. 38) with basal area hyaline except for a small, triangular infuscate spot about half way along and below submarginal vein, wing slightly infumate from level with apex of submarginal vein to apex, becoming paler distally; gaster dark brown, basal tergite with strong metallic green and purple sheen, ovipositor sheaths yellowish orange.

Head. Antennal scrobes more or less semicircular. Relative measurements of head: head width 104, frontovertex width at median ocellus 15·5, malar space 42, eye length 70, eye width 66, POL 8·5, OOL 0·5, scape length 51, other proportions of antenna as in Fig. 44.

Thorax. Mesopleuron with shallow reticulate sculpture, anterior half strigose. Relative measurements of forewing (Fig. 38): length 248, maximum width 97, other proportions as in Fig. 48.

Gaster. Relative measurements: length of exserted part of ovipositor 63, length of gaster 125, length from base of gaster to apex of hypopygium 67.

♂. Length: 1·56 mm.

Colour. Head and thorax black with weak metallic purple, green and brassy reflections; lower parts of face strongly metallic green; antennae yellow except clava which is pale brown; mesopleuron with distinct purple coloration; coxae dark brown, remainder of legs yellow; gaster dark brown. Relative measurements; head: width 92, frontovertex width at median ocellus 32, malar space 32, eye length 59, eye width 45, POL 13, OOL 2, scape length 38, other proportions of antennae as in Fig. 174; forewing: length 212, maximum width 99, length of submarginal vein 85, of marginal vein 10, other proportions as in Fig. 175.

DISTRIBUTION. Trinidad.

BIOLOGY. Reared from Margarodidae (Homoptera) (probably hyperparasitic on other Encyrtidae).

MATERIAL EXAMINED

Holotype ♀, **Trinidad**: iv.1963, ex *Icerya montserratensis* Riley & Howard (*F. D. Bennett*) (BMNH).
Paratype. 1 ♂, same data as holotype (BMNH).

COMMENTS. Also a further undescribed species from Guyana reared from the same host as the type-species (BMNH).

Closely related to *Cheiloneurus* (tribe Cheiloneurini) but can be separated using the characters given in the key.

ISODROMUS Howard

(Key couplets: ♀ 140, 217; ♂ 48. Figs 58, 124)

Isodromus Howard, 1887: 488. Type-species: *Isodromus iceryae* Howard, by monotypy.

Parataneostigma Girault, 1915*a*: 275. Type-species: *Parataneostigma nigriaxillae* Girault, by monotypy.

INCLUDED SPECIES. Fourteen, one of which is found in the Neotropics: *iceryae* Howard; also a further undetermined species from Peru (BMNH).

REFERENCE. Revision: Timberlake (1919*a*: 176–190).

DISTRIBUTION. Argentina, Brazil, Chile, Peru, Mexico, Cuba. World: cosmopolitan.

BIOLOGY. Parasites of Chrysopidae and Hemerobiidae (Neuroptera).

COMMENTS. Placed in the tribe Homalotylini, subtribe Homalotylina.

LEPTOMASTIDEA Mercet

(Key couplets: ♀ 113; ♂ 98)

Leptomastidea Mercet, 1916: 112. Type-species: *Leptomastidea aurantiaca* Mercet, by monotypy.

Tanaomastix Timberlake, 1918: 362. Type-species: *Paraleptomastix abnormis* Girault, by original designation.

Leptanusia De Santis, 1964: 80. Type-species: *Leptomastidea pseudococci* Brèthes, by monotypy. **Syn. n.**

INCLUDED SPECIES. Seventeen, five of which are found in the Neotropics: *abnormis* Girault, *antillicola* Dozier, 1937: 121, *bahiensis* (Compere) (**comb. n.** from *Leptomastix*), *dispar* (Kerrich) (**comb. n.** from *Leptomastix*) and *pseudococci* Brèthes (De Santis, 1964: 82).

REFERENCES. Mercet (1924: 252–258), Kerrich (1953: 790–791).

DISTRIBUTION. Throughout the Neotropics. World: cosmopolitan.

BIOLOGY. Parasites of Pseudococcidae (Homoptera).

COMMENTS. I have examined the holotype of *Leptomastidea brethesi* Blanchard which was synonymized with *Leptomastidea pseudococci* Brèthes, the type-species of *Leptanusia*, by De Santis (1964: 82). It is a *Leptomastidea* belonging to the same group as *bahiensis* and *dispar*. It differs from all other species of *Leptomastidea* in having relatively shorter marginal cilia on the hindwing, but I do not think that this difference and the differences given by Trjapitzin (1971*c*: 86) warrant separate generic status. Kerrich (pers. comm.) suggested that *bahiensis* belongs to *Leptomastidea*.

The holotype male of *antillicola* Dozier has not been seen, but the species may be correctly placed in *Leptomastidea*.

Placed in the tribe Anagyrina, subtribe Leptomastideina.

LEPTOMASTIX Förster

(Key couplets: ♀ 119, 157; ♂ 99)

Leptomastix Förster, 1856: 34. Type-species: *Leptomastix histrio* Mayr, by monotypy through reference of Mayr (1876: 730).

Stenoterys Thomson, 1876: 115. Type-species: *Stenoterys orbitalis* Thomson, by monotypy.

Pseudleptomastix Girault, 1915*a*: 272. Type-species: *Pseudleptomastix squammulatus* Girault, by monotypy.

INCLUDED SPECIES. Thirty-seven, one of which is found in the Neotropics: *dactylopii* Howard (Dozier, 1927: 267), also one species from Mexico, near *squammulata* Girault, and a further species from Brazil (BMNH).

DISTRIBUTION. Throughout the Neotropics. World: cosmopolitan.

BIOLOGY. Parasites of Pseudococcidae (Homoptera).

COMMENTS. The undetermined species from Brazil apparently has a seven-segmented funicle and two-segmented clava as in *Alamella* Agarwal, but since the venation is more typical of *Leptomastix* I include it in the latter.

Placed in the tribe Anagyrini, subtribe Anagyrina. See comments under *Anagyrus*.

***LIRENCYRTUS* gen. n.**

(Key couplets: ♀ 162; ♂ 124. Figs 74, 177–181)

Type-species: *Lirencyrtus primus* sp. n.

♀. *Head.* In side view moderately deep with frontovertex and face more or less uniformly curved but mostly so level with top of antennal scrobes. Eye about one-third longer than broad, with numerous short hairs and reaching occipital margin which is sharp. Malar space from much less than to slightly more than half length of eye with malar sulcus absent or present. Frontovertex at narrowest point about one-third head width and with fairly conspicuous dark setae; ocelli more or less forming a right angle, posterior ocellus separated from occipital margin by less than its own diameter and from eye margin by about half its own diameter. Antennal scrobes moderately impressed and semicircular, meeting dorsally but quite short, not quite reaching half way from toruli to anterior ocellus; antennal torulus separated from mouth margin by slightly more than its own length and from other torulus by about one and a half times its own length, its dorsal margin about level with lowest margin of eye. Antenna with scape subcylindrical, pedicel conical and about as long as first funicle segment, all six funicle segments cylindrical and longer than broad, clava three-segmented, about half as long as and slightly broader than the funicle and with apex rounded, pointed or with a very short oblique truncation; longitudinal sensilla on all flagellar segments. Sculpture on frontovertex shallow coriaceous, sometimes very smooth or occasionally rougher behind ocelli, on lower parts of face becoming more elongate and shallower, cheeks almost smooth. Mandibles with three acute teeth, maxillary palpi four-segmented, labial palpi three-segmented.

Thorax. In side view moderately deep and dorsally convex, scutellum very convex. Dorsum of thorax with strong dark setae. Mesoscutum without notaular lines, about one-half broader than long, axillae touching, scutellum about as broad as long, propodeum medially relatively long, more than one-sixth as long as scutellum. Pronotum with fairly deep coriaceous sculpture, mesoscutum with coriaceous reticulate, reticulate-strigose, coriaceous-strigose or strigose sculpture, axillae dorsally with alutaceous sculpture, posterior margin steep and polished, scutellum anteriorly with numerous longitudinal ridges which run backwards from axillae, these sometimes short, but often about half length of scutellum, usually some sculpture between ridges which may extend nearly to apex but at least apex and usually apical one-third to half of scutellum very smooth and polished; mesopleuron more or less smooth but with some shallow, irregular sculpture anteriorly; propodeum usually with some sculpture in centre and along anterior margin from either side of middle third nearly to spiracles. Forewing hyaline, about two and a half times as long as broad; basal cell completely naked except for a few long setae in its apical half and a line below submarginal vein, speculum not interrupted and closed; submarginal vein with an apical hyaline break, marginal vein about three to four times as long as broad, about a half longer than stigmal which is slightly longer than postmarginal. Hindwing about four times as long as broad. Mid tibial spur about as long as mid basal tarsal segment.

Gaster. Slightly shorter than thorax, cerci at about one-third, paratergites absent, ovipositor not visible in dry mounted material, hypopygium reaching apex of gaster and medially incised at apex. Ovipositor short, less than half as long as mid tibia, gonostylus about one-quarter as long as mid tibial spur.

♂. Differs from female as follows: antennae with pedicel distinctly shorter than first funicle segment, all funicle segments longer than broad, clava entire, funicle dorsally with two or three groups of very long setae about three to four times as long as diameter of corresponding segment, ventrally setae not much longer than diameter of segment; aedeagus about two-fifths as long as mid tibia and digitus with one apical spine.

***Lirencyrtus primus* sp. n.**
(Figs 74, 177–181)

♀. Length: 1·22–1·44 mm (holotype 1·35 mm).

Colour. Frontovertex dark metallic green, purple along eye margins and below level of top of antennal toruli, scape testaceous, pedicel and flagellum brown; pronotum purplish brown, mesoscutum metallic green usually with purple reflections along posterior and anterior margins, sculptured area of scutellum purple, polished area green with some purple reflections, propodeum brown; foreleg, mid tarsus, mid tibial spur and hind coxae yellow to yellowish orange, mid coxae brown, mid femora in basal half, mid tibia in apical two-thirds, hind femora in basal third and hind tibia in apical half yellow to yellowish orange, remainder dark brown, but occasionally hind femora almost completely brown or mid femora, tibiae and hind tarsi almost completely yellow; gaster dark purplish brown with basal tergite metallic green with some purple reflections.

Head. Upper margin of antennal torulus about level with lowest margin of eye, vertex between posterior ocelli and occipital margin quite smooth and polished, malar sulcus absent, clava with apex more or less pointed. Relative measurements of head of holotype: head width 70, frontovertex width at median ocellus 25, malar space 14, eye length 43, eye width 34, POL 12, OOL 2·5, scape length 35, other proportions of antenna as in Fig. 177.

Thorax. Mesoscutum with coriaceous sculpture, of smaller mesh centrally, more transversely elongate laterally, scutellum with slightly more than apical half smooth and polished and with about seven to eleven strong ridges running backwards from axillae (Fig. 74) for a distance up to about half medial length of scutellum, propodeum with some very shallow sculpture in middle and along anterior margin either side of middle third almost to spiracles, anterior margin with a transverse shallow trough which extends almost to spiracle, the trough traversed by several carinae. Forewing (Fig. 178) with marginal vein variable in thickness, from three to four times as long as broad. Relative measurements of forewing of holotype: length 207, maximum width 83, length of submarginal vein 78, of marginal vein 13·5, of stigmal vein 10, of postmarginal vein 8·5; of hindwing: length 143, maximum width 37.

Gaster. Relative measurements of paratype: length of ovipositor 34, of gonostylus 5 [mid tibia 78, mid tibial spur 20]. Ovipositor as in Fig. 180.

♂. Length: 1·11–1·40 mm.
Similar to female except the frontovertex, which is very slightly broader, antennae (Fig. 179) and genitalia (Fig. 181).

DISTRIBUTION. Brazil.

BIOLOGY. Unknown.

MATERIAL EXAMINED

Holotype ♀, **Brazil**: Santa Catarina, Nova Teutonia, 9.vii.1943 (*F. Plaumann*) (BMNH).

Paratypes. **Brazil**: 1 ♀, Nova Teutonia, 8.viii.1935; 2 ♀, 2 ♂, Nova Teutonia, 18.v.1943; 3 ♀, 1 ♂, Nova Teutonia, vi.1943; 3 ♀, Nova Teutonia, vii.1943; 1 ♀, 1 ♂, Nova Teutonia, ix.1943; 1 ♀, Nova Teutonia, 10.x.1943; 1 ♂, Nova Teutonia, xi.1949; 1 ♀, Nova Teutonia, vi.1971 (*F. Plaumann*). (BMNH; CNC, Ottawa; MLP, Argentina; CIBC, Trinidad; UC, Riverside; PPRI, Pretoria; ZI, Leningrad).

COMMENTS. I have examined a further nine undescribed species from Brazil, Trinidad, Jamaica, Dominica and Panama (BMNH; CNC, Ottawa; USNM, Washington).

The genus appears to be close to *Helegonatopus* (tribe Chalcerinyini), but the female mainly differs in having a short ovipositor, very short gonostyli, anterior ridges on the scutellum and the hypopygium reaching the apex of the gaster. *Helegonatopus* has the ovipositor much longer than the mid tibia, the gonostyli about twice as long as the mid tibial spur, no anterior ridges on the scutellum, and the hypopygium reaching at most about two-thirds along the gaster.

LITOMASTIX Thomson
(Key couplets: ♀ 200, 218; ♂ 49, 51. Figs 96, 122)

Litomastix Thomson, 1876: 171. Type-species: *Encyrtus chalconotus* Dalman, by designation of Ashmead (1900: 363).

Pentacnemus Howard, 1892: 366. Type-species: *Pentacnemus bucculatricis* Howard, by monotypy.
Berecyntus Howard, 1898*b*: 237. Type-species: *Berecyntus bakeri* Howard, by monotypy.
Paracopidosomopsis Girault, 1916*d*: 49. Type-species: *Berecyntus floridanus* Ashmead, by monotypy.
Litomastiellus Mercet, 1921: 443. Type-species: *Litomastix claviger* Mercet, by designation of Peck *in* Muesebeck *et al.* (1951: 481).
Limastotix Mercet, 1921: 443. Type-species: *Litomastix hispanicus* Mercet, by monotypy.
Berecyntiscus Ghesquière, 1946: 368. [Unnecessary replacement name for *Berecyntus* Howard.]

INCLUDED SPECIES. Thirty-six, three of which are found in the Neotropics: *calypso* (Crawford, 1914: 88) **(comb. n.** from *Holcencyrtus*), *floridana* Ashmead, 1900: 365, *truncatella* (Dalman) (= *aestivalis* Mercet, 1921: 447); also a further two undescribed species from Ecuador and Trinidad (BMNH; CNC, Ottawa).

DISTRIBUTION. Throughout the Neotropics. World: cosmopolitan.

BIOLOGY. Polyembryonic parasites of larvae of Lepidoptera.

COMMENTS. It is very likely that *calypso* and *floridana* are the same species as *truncatella*. The two undetermined species from Trinidad and Ecuador are very distinct from this species and belong to the *thebe*-group.

Placed in the tribe Copidosomatini, subtribe Copidosomatina. See comments under *Copidosoma*.

LOCHITOENCYRTUS De Santis

(Key couplets: ♀ 184; ♂ 25. Fig. 86)

Lochitoencyrtus De Santis, 1964: 264. Type-species: *Lochitoencyrtus gahani* De Santis, by monotypy.

INCLUDED SPECIES. One: *gahani* De Santis, 1964: 265.

DISTRIBUTION. Argentina, Brazil, Trinidad.

BIOLOGY. Unknown.

COMMENTS. Placed in the tribe Trechnitini by Trjapitzin (1973*b*); this is very probably wrong.

The genus is similar in appearance to *Aminellus* Masi (tribe Bothriothoracini, subtribe Aminellina) but differs in the head being relatively more deep (i.e. less lenticular), the stigmal vein straight, the punctures on the head shiny bottomed and the mesoscutum and scutellum lacking deep piliferous punctures. Even though it superficially resembles *Aminellus* I do not think that the genus belongs in the tribe Bothriothoracini. I am unable to satisfactorily place it according to Trjapitzin's classification of the Encyrtidae.

LOHIELLA gen. n.

(Key couplet: ♀ 165. Figs 182, 183)

Type-species: *Encyrtus flaviclavus* Howard *in* Riley, Ashmead & Howard, 1894: 96.

♀. *Head.* Moderately deep inside view and more or less abruptly bent at level of top of antennal scrobes. Eye about one-third longer than broad, with numerous short hairs and reaching occipital margin which is sharp. Malar space about half as long as eye and with malar sulcus absent. Frontovertex at narrowest point slightly less than one-quarter head width; ocelli forming a slightly obtuse angle, posterior ocellus separated from occipital margin by slightly less than its own diameter and from eye margin by less than half its own diameter. Antennal scrobes shallow but meeting dorsally, reaching about half way from antennal toruli to anterior ocellus, antennal torulus separated from mouth margin by about one and a half times its own length and from other torulus by about its own length, torulus high on head, its ventral margin only very slightly below ventral margin of eye. Antennal scape subcylindrical, pedicel conical and subequal in length to all six funicle segments which are all slightly longer than broad and cylindrical, clava three-segmented, about as wide as funicle and with apex rounded (Fig. 182); longitudinal sensilla on all flagellar segments. Sculpture on frontovertex shallow, shagreened, more elongate between eyes and antennal scrobes, and on genae. Mandibles with two acute teeth and a truncation, maxillary palpi four-segmented, labial palpi three-segmented.

Thorax. In side view moderately deep, mesoscutum convex and scutellum almost flat. Mesoscutum without notaular lines and about a half broader than long, axillae slightly separated by posterior margin of mesoscutum, scutellum about as broad as long, propodeum medially about one-sixth as long as scutellum. Pronotum, mesoscutum and axillae with similar sculpture to frontovertex but slightly deeper, laterally and on axillae more transversely elongate, scutellum with deeper, raised, elongate sculpture more or less arranged in whorls which is similar in appearance to a fingerprint, apex and sides of scutellum entirely smooth, mid pleuron almost smooth but with raised elongate sculpture, propodeum medially with some shallow sculpture. Forewing (Fig. 183) hyaline and about two and a half times as long as broad; basal cell naked in its proximal half, speculum not interrupted and open; submarginal vein with apical hyaline break, marginal vein distinctly longer than broad, longer than radial which in turn is longer than postmarginal. Hindwing about three and a half times as long as broad. Mid tibial spur slightly longer than mid basal tarsal segment.

Gaster. Slightly shorter than thorax with cerci at about one-third, apex of hypopygium slightly more than half way along gaster, ovipositor only slightly exserted.

♂. Unknown.

INCLUDED SPECIES. One: *flaviclava* (Howard) (Noyes, 1979: 154).

DISTRIBUTION. St Vincent, Trinidad.

BIOLOGY. Unknown.

COMMENTS. The species previously undetermined by Noyes (1979: 154) is merely a form of *flaviclava*; the mandibles have two acute teeth and a truncation, not three acute teeth as stated.

This genus bears a superficial resemblance to some species of *Rhytidothorax*, but undoubtedly belongs to the tribe Microteryini and very probably the subtribe Microteryina.

MARIOLA gen. n.

(Key couplet: ♀ 75. Figs 42, 184, 185)

Type-species: *Mariola flava* sp. n.

♀. Body generally dorso-ventrally flattened (Fig. 42).

Head. Occipital foramen high on head at about four-fifths head length. Eye about two and a half to three times as long as broad, naked and very nearly reaching occipital margin which is sharp. Malar space about one-fifth length of eye, with malar sulcus absent. Frontovertex at narrowest point slightly less than half head width, inner eye margins slightly concave but almost parallel, ocelli more or less forming a right angle, posterior ocellus separated from occipital margin by slightly more than its own diameter and from eye margin by slightly more than twice its own diameter. Antennal scrobes absent, torulus very nearly touching mouth margin and separated from other torulus by about three times its own length. Antennal scape slightly expanded and flattened, pedicel conical, about half as long as funicle, funicle six-segmented, all segments transverse, the distal ones much longer and broader, clava three-segmented, broader than and about as long as funicle and with apex rounded. Frontovertex with shallow coriaceous sculpture. Mandibles narrow, with three acute teeth, the middle one slightly the longest.

Thorax. Pronotum not longitudinally divided in centre, mesoscutum without notaular lines, about a half broader than long, axillae meeting, scutellum only very slightly broader than long, with sides (in dorsal view) rounded and apex pointed, propodeum medially about one-seventh as long as scutellum. Pronotum, mesoscutum and axillae with shallow coriaceous sculpture, similar to that on frontovertex, scutellum more or less smooth and polished. Forewing more or less hyaline but slightly and irregularly infumate from about half way along submarginal vein to apex of postmarginal; wing about three times as long as broad; basal cell sparsely but almost entirely with setae, costal cell narrow, about as wide as submarginal vein, speculum interrupted by a few setae and closed; submarginal vein with an apical hyaline break, marginal vein slightly more than twice as long as broad, slightly shorter than stigmal and about twice as long as postmarginal. Hindwing slightly more than five times as long as broad. Mid tibial spur shorter than mid basal tarsal segment.

Gaster. About one-quarter longer than thorax, cerci about half way along but just in apical half, hypopygium nearly reaching apex of gaster, exserted part of ovipositor slightly longer than one-third of gaster and with sheaths distinctly flattened, deepest at about middle of exserted part and gradually tapering towards apex.

♂. Unknown.

Named in honour of my wife.

Mariola flava sp. n.

(Figs 42, 184, 185)

♀. Length (excluding ovipositor) 0·99 mm.

Colour. Body completely yellowish orange except antenna which has scape and pedicel testaceous and flagellum brown, propodeum slightly infuscate, gaster with a small area just anterior of each cercus and sides near apex brown.

Head. Relative measurements of head: maximum width 45, frontovertex width at median ocellus 18, malar space 6, eye length 28, eye width approximately 10, POL 7, OOL 4·5, scape length 18, other proportions of antenna as in Fig. 185.

Thorax. Relative measurements of forewing (Fig. 184): length 115, maximum width 34, length of submarginal vein 50, marginal vein 5, stigmal vein 7, postmarginal vein 2.

Gaster. About one-quarter longer than thorax, cerci about half way along but just in apical half,

♂. Unknown.

DISTRIBUTION. St Vincent.

BIOLOGY. Unknown.

MATERIAL EXAMINED

Holotype ♀, **St Vincent**: St George, Belmont, 6.vii.1976 (*J. S. Noyes*) (BMNH).

COMMENTS. Belongs to the tribe Microteryini, subtribe Platencyrtina and differs from the only included genus, *Platencyrtus* Ferrière, in having the ovipositor well exserted with sheaths flattened, relatively longer scutellum, narrower frontovertex and cerci more advanced on the gaster. *Platencyrtus* has the ovipositor hardly exserted with the sheaths cylindrical, scutellum triangular in shape and about one and three-quarter times as broad as long, frontovertex about two-thirds head width and cerci nearer apex of gaster at about four-fifths.

MERCETENCYRTUS Trjapitzin

(Key couplets: ♀ 175, 203, 258; ♂ 130, 133)

Mercetencyrtus Trjapitzin, 1963: 884. Type-species: *Encyrtus ambiguus* Nees, by monotypy.

INCLUDED SPECIES. Two, one of which is found in the Neotropics: *gracilicornis* (De Santis, 1964: 191) (**comb. n.** from *Syrphophagus*); also a further one (or two) undescribed species from Trinidad and Panama (BMNH; CNC, Ottawa).

DISTRIBUTION. Argentina, Brazil, Trinidad, Panama. World: cosmopolitan.

BIOLOGY. Unknown.

COMMENTS. The South American species are very close to *ambiguus* Nees but differ in the relative lengths of the funicle segments and coloration of the legs. The mandibles are also different in lacking, or apparently lacking the fourth (second lowest) tooth. However, one slide-mounted specimen from Trinidad appears to have a four-toothed right mandible and a three-toothed left mandible.

The species of *Mercetencyrtus* have a pit, or some similar structure, laterally on each side of the scutellum which is clearly visible in slide-mounted material. In *ambiguus* it is fairly small and situated close to the axillae whereas in *gracilicornis* it is relatively larger and nearly half way along the scutellum. It is possible that there are many other species present in other parts of the world since those I have seen from Africa and Australia appear to represent unknown species.

The genus cannot be placed according to Trjapitzin's classification of the Encyrtidae.

MEROMYZOBIA Ashmead
(Key couplets: ♀ 12; ♂ 12)

Meromyzobia Ashmead, 1900: 349. Type-species: *Ericydnus maculipennis* Ashmead, by original designation.

Included species. Eight, two of which are found in the Neotropics: *flavipes* De Santis, 1972*b*: 52 and *gripha* De Santis, 1968: 152.

Distribution. Argentina. World: Nearctic region.

Biology. Parasites of eggs of Orthoptera.

Comments. Both of the South American species differ from other species of *Meromyzobia* in having only five funicle segments (one anelliform) instead of six (two anelliform). However, I think these species are well placed here.

Placed in the tribe Miraini, subtribe Mayridiina by Trjapitzin & Gordh (1978*b*).

METAPHYCUS Mercet
(Key couplets: ♀ 64, 77, 136, 194, 211, 232, 233; ♂ 55, 68. Fig. 129)

Metaphycus Mercet, 1917*a*: 138. Type-species: *Aphycus zebratus* Mercet, by monotypy.

Euaphycus Mercet, 1921: 197. Type-species: *Encyrtus hederaceus* sensu Mercet nec Westwood (see Graham 1969: 224–225), designated by Mercet (1925: 23).

Mercetiella Dozier, 1926: 98. Type-species: *Mercetiella reticulata* Dozier, by monotypy.

Melanphycus Compere, 1947: 5. Type-species: *Pseudococcobius fumipennis* Timberlake, by original designation.

Notoencyrtus De Santis, 1964: 211. Type-species: *Notoencyrtus guttofasciatus* De Santis, by monotypy. **Syn. n.**

Included species. One hundred and twelve, 22 of which are found in the Neotropics: *alboclavatus* Compere, 1939: 63, *amoenus* (Howard; Noyes, 1979: 160), *angustifrons* Compere, 1957: 227, *brasiliensis* Compere & Annecke, 1961: 36, *ceroplastae* (Dozier, 1936: 185) (**comb. n.** from *Coccidoctonus*), *discolor* (De Santis, 1970: 13) (**comb. n.** from *Aphycus*), *eruptor* (Howard; Timberlake, 1916: 628), *flavus* (Howard; Mercet, 1921: 209), *guttofasciatus* (De Santis, 1964: 212) (**comb. n.** from *Notoencyrtus*), *helvolus* (Compere, 1926: 25), *lounsburyi* (Howard, 1898*b*: 244), *luteolus* (Timberlake, 1916: 636), *maculipes* (Howard; Timberlake, 1916: 621) (**comb. n.** from *Aphycus*), *mexicanus* (Howard; Timberlake, 1916: 627), *monticolens* Dozier, 1937: 124, *niger* (Brèthes; De Santis, 1964: 143) (**comb. n.** from *Aphycus*), *oaxacae* (Howard, 1898*b*: 246) (**comb. n.** from *Aphycus*), *ogloblini* (De Santis, 1972*b*: 48) (**comb. n.** from *Dicarnosis*), *portoricensis* (Dozier, 1926: 100) (**comb. n.** from *Euaphycus*), *reticulatus* (Dozier, 1926: 98), *rusti* (Timberlake, 1916: 617) (**comb. n.** from *Aphycus*), *stanleyi* Compere, 1940: 20; also many undetermined species from Brazil, Colombia, Panama and Trinidad (BMNH; CNC, Ottawa).

References. Timberlake (1916: 587–639); Annecke & Mynhardt (1971; 1972).

Distribution. Throughout the Neotropics. World: cosmopolitan.

Biology. Parasites of Coccidae, Diaspididae, Lacciferidae and Eriococcidae (Homoptera).

Comments. I have examined a paratype of *Notoencyrtus guttofasciatus*. It is a male *Metaphycus* (not female as stated by De Santis).

The species described by Dozier as *Coccidoctonus ceroplastae* is very probably misplaced in *Metaphycus* and may even belong to the tribe Microteryini. However, I feel that it is best placed here until its taxonomic position can be better determined.

Two of the South American species of *Metaphycus* are unusual (including *discolor*) in that the ovipositor is well exserted, the exserted part being about as long as the gaster.

Placed in the tribe Aphycini, subtribe Paraphycina.

MICROTERYS Thomson
(Key couplets: ♀ 65, 126; ♂ 66, 83, 105, 117. Fig. 133)

Microterys Thomson, 1876: 155. Type-species: *Encyrtus sylvius* Dalman, by designation of Ashmead (1900: 390).
Sceptrophorus Förster, 1856: 34. Type-species: *Encyrtus sceptriger* Förster, by monotypy. [Suppressed in favour of *Microterys* Thomson: Opinion 1110, 1978, *Opin. Decl. int. Commn zool. Nom.* **35**: 99–100.]
Apentelicus Fullaway, 1913: 26. Type-species: *Apentelicus kotinskyi* Fullaway, by monotypy.

INCLUDED SPECIES. One hundred and twenty-five, four of which are found in the Neotropics: *elegans* Blanchard (De Santis, 1964: 183), *flavus* (Howard) (= *frontatus* Mercet, 1921: 413), *kotinskyi* (Fullaway, 1913: 26), *tricoloricornis* (Destefani) (= *consobrinus* Mercet, 1921: 417, 709); also one undetermined species from Brazil (BMNH).

REFERENCE. Rosen (1976).

DISTRIBUTION. Throughout the Neotropics. World: cosmopolitan.

BIOLOGY. Parasites of Coccidae, Aclerdidae, Eriococcidae, Kermesidae, Kerridae, Lecaniodiaspididae and Pseudococcidae (Homoptera).

COMMENTS. I have examined the syntypes of *elegans*; they are very probably the same as *flavus*, differing only in the extent of the infuscation of the forewing.

Placed in the tribe Microteryini, subtribe Microteryina.

MOORELLA Cameron
(Key couplet: ♀ 90. Fig. 45)

Moorella Cameron, 1913: 124. Type-species: *Moorella fulviceps* Cameron, by monotypy.
Chrysopophilus Timberlake, 1925: 178. Type-species: *Chrysopophilus compressiventris* Timberlake, by monotypy. **Syn. n.**

INCLUDED SPECIES. Two: *compressiventris* (Timberlake, 1925: 179) (**comb. n.**) and *fulviceps* Cameron, 1913: 125; also probably a further undetermined species from Panama.

DISTRIBUTION. Guyana, Panama.

BIOLOGY. Parasites of larvae of Chrysopidae (Neuroptera).

COMMENTS. I have examined a paratype of *Chrysopophilus compressiventris*; it is congeneric with *M. fulviceps* but is a distinct species.

The genus belongs to the tribe Homalotylini, subtribe Homalotylina.

MUCRENCYRTUS gen. n.
(Key couplets: ♀ 39, 117, 174, 193; ♂ 76. Figs 80, 84, 90, 186–189)

Type-species: *Mucrencyrtus insulanus* sp. n.

♀. *Head.* In profile, deep and most rounded level with top of antennal scrobes. Eye about one-quarter longer than broad, naked and reaching occipital margin which is rounded. Malar space less than half length of eye with malar sulcus weakly indicated. Frontovertex at narrowest point about two-fifths head width, ocelli small and more or less forming a right angle, posterior ocellus about two to four times its own diameter from occipital margin and less than its own diameter from eye margin. Antennal scrobes deep with outer margins, at extreme uppermost point, sharply margined, interantennal prominence, in outline like an inverted Y with edge sharp above antennal toruli and produced as a long, narrow, sharp ridge which nearly reaches frontovertex; antennal torulus separated from mouth margin by slightly less than its own length and from other torulus by slightly more than its own length, its dorsal margin slightly above level of lowest eye margin. Antennal scape subcylindrical or very slightly flattened, pedicel conical, longer than first funicle segment, funicle six-segmented, cylindrical and widening very slightly distally, clava three-segmented, with apex rounded and about half as long as funicle; longitudinal sensilla on all flagellar segments. Frontovertex with shallow reticulate to punctiform reticulate sculpture which becomes slightly elongate and sometimes shallow coriaceous on lower parts of face and genae. Mandibles with three teeth, upper tooth slightly rounded, maxillary palpi four-segmented, labial palpi three-segmented.

Thorax. In side view moderately deep, mesoscutum and scutellum flat. Mesoscutum about two to two and a half times as broad as long, without notaular lines or with notaular lines vaguely indicated anteriorly, axillae meeting, scutellum about as broad as long, very flat with apex pointed and produced as a very narrow translucent flange which overhangs the propodeum, propodeum medially longer than one-sixth length of scutellum. Pronotum, mesoscutum and axillae with shallow coriaceous sculpture, sometimes almost smooth; scutellum with distinctly deeper coriaceous, almost reticulate, sculpture of smaller mesh; metanotum and propodeum with reticulate sculpture, area either side of median area of propodeum transversely strigose almost to spiracles, propodeum sometimes smooth medially; mesopleuron with shallow, slightly elongate, reticulate sculpture. Forewing hyaline or with a central fuscous spot, basal cell and costal cell (sometimes less so) densely hairy, speculum occasionally interrupted but always closed, submarginal vein without apical hyaline break, marginal vein not reaching anterior margin of wing, at most as long as broad, apical cilia absent or very short. Macropterous forms: forewing about two and a half times as long as broad, marginal vein about one-quarter to half as long as stigmal, postmarginal very short, almost absent; hindwing about two and a half times as long as broad. Micropterous forms: forewing slightly more than twice as long as broad with apex truncate, marginal vein only slightly shorter than stigmal; hindwing about two and a half times as long as broad with apex obliquely truncate. Mid tibial spur very slightly shorter than corresponding basitarsus.

Gaster. About as long as thorax, dorsally flat, ventrally very convex, cerci at about one-third, paratergites absent, hypopygium with a long, thin apical extension which reaches apex of gaster (as in Fig. 84), not notched apically. Ovipositor about as long as mid tibia, gonostyli apparently absent.

♂. Essentially similar to female except no micropterous forms known; antennae (as in Fig. 188), setae in basal cell of forewing less dense, last gastral sternite of normal shape.

***Mucrencyrtus insulanus* sp. n.**

(Figs 80, 84, 90, 186–189)

♀. Length: 1·27–1·43 mm (holotype 1·35 mm).

Colour. Body completely orange, metanotum, propodeum and extreme of gaster slightly mixed fuscous, forewing hyaline.

Head. Posterior ocellus about two and a half times its own diameter from occipital margin; frontovertex with shallow, punctiform-reticulate sculpture which becomes more irregular on lower parts of face and cheeks. Relative measurements of head of holotype; head width 91, frontovertex width at median ocellus 36, malar space 23, eye length 55, eye width 43, POL 26, OOL 3, scape length 34, other proportions of antenna as in Fig. 189. Head in frontal aspect as in Fig. 80.

Thorax. Mesoscutum and scutellum with numerous translucent setae which appear white in some light. Propodeum with dense reticulate sculpture, anteriorly from either side of middle nearly to spiracles almost transversely striate. Macropterous form: forewing at extreme apex and along anterior margin without marginal cilia, basal cell with setae nearly as dense as, but markedly stronger than, those in centre of wing, costal cell with setae as dense as basal cell, speculum not interrupted; relative measurements of forewing of holotype: length 172, maximum width 68, length of submarginal vein 74, of marginal vein 5, of stigmal vein 11, of postmarginal vein 0·5; of hindwing: length 112, maximum width 31. Micropterous form: setae of forewing similar to macropterous form, wing margin without setae, apex of wing very slightly obliquely truncate; relative measurements of forewing of paratype: length 75, maximum width 31, length of submarginal vein 52, of marginal vein 3, of stigmal vein 5·5, of postmarginal vein 0·5; of hindwing: length 40, maximum width 12, apex distinctly obliquely truncate.

Gaster. In side view as in Fig. 84. Relative measurements of paratype: length of ovipositor 59 [mid tibia 65]. Ovipositor as in Fig. 187.

♂. Length: 1·08–1·20 mm.

Essentially similar to female except the following: lower parts of face whitish, occiput, pronotum, propodeum and metanotum marked with dark brown, centre of thorax yellowish white, dorsum of gaster brownish; ocelli forming a distinctly obtuse angle; forewing (Fig. 90) with setae in basal and costal cells not quite as dense. Male genitalia (Fig. 186): each digitus with two apical spines. Relative measurements of paratype: head width 75, frontovertex width at median ocellus 35, malar space 20, eye length 40, POL 24, OOL 3, scape length, proportions of antenna as in Fig. 188.

DISTRIBUTION. Trinidad, St Vincent.

BIOLOGY. Reared from *Aclerda* sp. (Homoptera: Aclerdidae).

MATERIAL EXAMINED

Holotype ♀, **Trinidad**: St George, St Augustine, x.1976 (*F. D. Bennett*) (BMNH).

Paratypes. **Trinidad**: 2 ♀, Orange Grove, i.1973, ex *Aclerda* sp. on sugarcane (*F. D. Bennett*); 1 ♀, Curepe, Santa Margarita Circular Road, 15–28.i.1974 (*F. D. Bennett*); 2 ♀, 2 ♂, St Augustine, 21.vi.1976 (*J. S. Noyes*); 1 ♂, St Vincent, St George, Argyle, 8.vii.1976 (*J. S. Noyes*). (BMNH; CIBC, Trinidad; CNC, Ottawa.)

COMMENTS. Two further species examined: *Mucrencyrtus aclerdae* (De Santis) (**comb. n.** from *Aenasioidea*) and an undetermined species from Ecuador (CNC, Ottawa). *M. aclerdae* has a large infuscate spot in the centre of the forewings and the setae in the costal cell less dense than in the type-species.

Very close to *Allencyrtus* Annecke & Mynhardt (tribe Microteryini, subtribe Microteryina) which differs in having a metallic body (greenish blue), hypopygium barely extended apically and deeply notched, propodeum rather smooth, mandibles with upper tooth rudimentary and forewings more or less generally suffused greyish.

NEAPSILOPHRYS gen. n.

(Key couplet: ♀ 150. Figs 68, 190–191)

Type-species: *Neapsilophrys flavipes* sp. n.

♀. *Head.* In side view, moderately deep and most rounded level with top of antennal scrobes, frontovertex slightly convex. Eye about one-third longer than broad, naked and reaching occipital margin. Malar space slightly longer than half length of eye with malar sulcus absent. Frontovertex at narrowest point, slightly less than half head width, ocelli forming a slightly obtuse angle, posterior ocellus separated from occipital and eye margins by less than its own diameter. Antennal scrobes shallow, separated dorsally by continuation of interantennal prominence, and reaching about half way from antennal toruli to anterior ocellus; antennal torulus separated from mouth margin and other torulus by about its own length. Scape subcylindrical, pedicel conical and about same length as first funicle segment, all six funicle segments longer than broad and cylindrical, clava three-segmented, apically rounded and about as wide as funicle; longitudinal sensilla on all flagellar segments. Frontovertex with irregular reticulate sculpture which is much shallower on lower parts of face so that genae and areas below eyes are almost completely smooth. Mandibles tridentate with upper tooth rounded or blunt, maxillary palpi four-segmented, labial palpi three-segmented.

Thorax. In side view moderately deep and dorsally convex. Mesoscutum without notaular lines, about a half broader than long, axillae almost meeting, scutellum distinctly longer than broad and with apex rounded and slightly produced as a flange, propodeum medially about one-seventh as long as scutellum. Pronotum with coriaceous sculpture, mesoscutum with raised reticulate sculpture medially but laterally with strigose sculpture, scutellum with fine strigose sculpture except extreme apex which is polished, mesopleuron with strigose sculpture which posteriorly becomes more reticulate, propodeum smooth. Forewing hyaline, about two and a half times as long as broad, basal cell hairy except for proximal one-third which is hyaline, speculum open but interrupted by two or three lines of setae; submarginal vein with an apical hyaline break, marginal vein more than twice as long as broad and about as long as stigmal, postmarginal vein nearly twice as long as stigmal. Mid tibial spur slightly shorter than mid basal tarsal segment.

Gaster. Slightly longer than thorax and apically compressed from side to side. Cerci at about one-third, paratergites absent, hypopygium very nearly reaching apex of gaster, exserted part of ovipositor slightly longer than half length of gaster. Ovipositor one and a half times as long as gaster or about two and a half times as long as mid tibia, gonostylus about as long as mid tibia.

♂. Unknown.

Neapsilophrys flavipes sp. n.
(Figs 68, 190, 191)

♀. Length (excluding ovipositor): 1·75–1·96 mm (holotype 1·81 mm).

Colour. Frontovertex and dorsum of thorax metallic green, pronotum and scutellum strongly tinged purple, antenna with scape and pedicel yellow to yellowish brown, flagellum brown, lower parts of face, genae, temples and mesopleura purple, legs yellow except mid and hind coxae which are brown, base of gaster yellow, propodeum and remainder of gaster, including ovipositor sheaths, brown.

Head. Relative measurements of head of holotype: head width 76·5, frontovertex width at median ocellus 34, malar space 28, eye length 45, eye width 34, POL 17, OOL 3, length of scape 49, proportions of antenna as in Fig. 191.

Thorax. Relative measurements of forewing of holotype: length 228, maximum width 89, length of submarginal vein 87, of marginal vein 15, of stigmal vein 14·5, of postmarginal vein 27; of hindwing: length 148, maximum width 42. Base of forewing Fig. 68.

Gaster. Relative length of paratype: length of ovipositor 238, of gonostylus 104 [mid tibia 96]. Genitalia as in Fig. 190.

DISTRIBUTION. Brazil.

BIOLOGY. Unknown.

MATERIAL EXAMINED

Holotype ♀, **Brazil**: Santa Catarina, Nova Teutonia, 14.xi.1944 (*F. Plaumann*) (BMNH).

Paratypes. **Brazil**: 1 ♀, Nova Teutonia, 14.xi.1944; 4 ♀, Nova Teutonia 16.xi.1944; 8 ♀, Nova Teutonia, 30.iii.1945; 2 ♀, Nova Teutonia, 27.iv.1945 (*F. Plaumann*). (BMNH; USNM, Washington; CIBC, Trinidad; CNC, Ottawa; MLP, Argentina; PPRI, Pretoria; ZI, Leningrad.)

COMMENTS. The genus belongs to the tribe Copidosomatini, subtribe Ageniaspidina. It can be separated from other members of the subtribe found in South America using the characters given in the key. In many ways the genus is intermediate between this subtribe and the Copidosomatina, the venation and arrangement of the setae at the base of the forewing being typical of the former but the body is generally typical of the latter.

Also superficially similar to *Deloencyrtus* but differs in having the gaster apically bilaterally flattened, the eyes naked, the scutellum convex and the hypopygium without a strong apical median incision, whereas *Deloencyrtus* has the gaster dorso-ventrally flattened, the eyes distinctly hairy, the scutellum flat and the apex of the hypopygium with a strong apical median incision.

NEOCOCCIDENCYRTUS Compere
(Key couplets: ♀ 102, 118, 245; ♂ 142. Figs 52, 103)

Neococcidencyrtus Compere, 1928: 209. Type-species: *Neococcidencyrtus alula* Compere, by monotypy.
Xenocomys Blanchard, 1940: 106. Type-species: *Xenocomys chrysomphali* Blanchard, by monotypy.

INCLUDED SPECIES. Five, two of which are found in the Neotropics: *chrysomphali* (Blanchard; De Santis, 1964: 188), *crouzelae* De Santis, 1964: 233; also two undetermined species from Brazil and Trinidad (BMNH).

REFERENCE. Key to world species: Myartseva (1977*b*: 175).

DISTRIBUTION. Argentina, Brazil, Trinidad. World: Nearctic, Palaearctic and Ethiopian regions.

BIOLOGY. Parasites of Diaspididae (Homoptera).

COMMENTS. Very probably a member of the tribe Habrolepidini.

NEODUSMETIA Kerrich
(Key couplets: ♀ 37; ♂ 45. Fig. 18)

Neodusmetia Kerrich, 1964: 76. Type-species: *Dusmetia sangwani* Subba Rao, by monotypy.

INCLUDED SPECIES. One: *sangwani* (Subba Rao, 1957: 385).

DISTRIBUTION. Mexico, Brazil. World: Nearctic, Ethiopian and Oriental regions.

BIOLOGY. Parasites of Pseudococcidae (Homoptera).

COMMENTS. Placed in the tribe Dinocarsini by Gordh & Trjapitzin (1978*b*).

OOENCYRTUS Ashmead

(Key couplets: ♀ 39, 82, 171, 199, 247, 255; ♂ 81, 114, 122. Figs 76, 77)

Ooencyrtus Ashmead, 1900: 381. Type-species: *Encyrtus clisiocampe* Ashmead, by original designation.
Schedius Howard, 1910: 2. Type-species: *Schedius kuwanae* Howard, by monotypy.
Pseudlitomastix Risbec, 1954: 1068. Type-species: *Litomastix creona* Risbec, by monotypy.

INCLUDED SPECIES. Seventy-eight, six of which are found in the Neotropics: *chrysopae* Crawford, 1913*b*: 347, *johnsoni* (Howard, 1898*a*: 18), *latiscapus* Gahan, 1927: 15, *prenidis* Gahan, 1943: 137, *submetallicus* (Howard; Noyes, 1979: 160) and *trinidadensis* Crawford, 1913*b*: 347; also five or six undetermined species from Trinidad and Brazil (BMNH; CNC, Ottawa).

DISTRIBUTION. Throughout the Neotropics. World: cosmopolitan.

BIOLOGY. Parasites of eggs of various insects, notably Lepidoptera and Heteroptera.

COMMENTS. *Ooencyrtus trinidadensis venatorius* De Santis & Sarmiento (in De Santis *et al.*, 1976: 7–9) may be a distinct species (De Santis, pers. comm.).

I have selected and labelled LECTOTYPE females from the syntype-series of each of *O. chrysopae* Crawford (labelled: 'Verdantvale, Arima, Trinidad, eggs Chrysopa 51–1 sp., F. W. Urich Collector, U.S.N.M. Type No. 16040') and *O. trinidadensis* Crawford (labelled 'reared from eggs of Pentatomid, Port of Spain, Trinidad, BWI, Feb. 1912, F. W. Urich Collector, Type No. 16039 U.S.N.M.') (USNM, Washington).

Placed in the tribe Microteryini, subtribe Ooencyrtina. See Comments under *Echthrodryinus*.

***PAPAKA* gen. n.**

(Key couplets: ♀ 246; ♂ 55. Figs 102, 192–196)

Type-species: *Papaka confusor* sp. n.

♀. *Head.* In side view moderately deep and quite triangular, frontovertex moderately convex. Eye about one-third longer than broad, naked and over-reaching occipital margin which is rounded. Clypeal margin broadly emarginate. Malar space nearly two-thirds eye length and with malar sulcus absent. Frontovertex about one-quarter head width; ocelli forming an acute angle of about 60°, posterior ocellus separated from occipital margin by about twice its diameter and nearly touching eye margin. Antennal scrobes shallow, meeting dorsally and reaching slightly further than half way from antennal toruli to anterior ocellus; antennal torulus separated from mouth margin by less than its own length and from other torulus by about one and a half times its own length, its dorsal margin well below ventral margin of eye. Antennal scape slightly expanded and flattened in its basal half, pedicel conical and longer than the first two funicle segments together, funicle six-segmented and cylindrical, the first two segments transverse or quadrate, the remainder longer than broad and hardly broadening distally, clava hardly wider than funicle, three-segmented with apex pointed and about half length of funicle; longitudinal sensilla on all flagellar segments except proximal three. Frontovertex with irregular coriaceous sculpture, more elongate on interantennal prominence and cheeks. Mandibles with two acute teeth and a rudimentary third (upper) tooth (Fig. 102), maxillary palpi four-segmented, labial palpi three-segmented.

Thorax. In side view, moderately deep with mesoscutum and scutellum flat. Mesoscutum without notaular lines, about one-third broader than long, axillae more or less meeting, scutellum slightly broader than long, very flat and with apex acute, propodeum medially about one-fifteenth as long as scutellum. Pronotum and mesoscutum slightly shiny with fairly regular shallow reticulate sculpture, more elongate towards side of mesoscutum, axillae with deep coriaceous sculpture, scutellum matt, with more or less regular punctate sculpture, propodeum almost smooth, mesopleuron almost smooth but with some very shallow, reticulate sculpture. Forewing hyaline, about two and a half times as long as broad; basal cell completely hairy, speculum interrupted by two or three lines of setae and closed; submarginal vein slightly expanded apically and with an apical hyaline break, marginal vein about twice as long as broad, less than half as long as stigmal and about twice as long as postmarginal. Hindwing about four and a half times as long as broad. Mid tibial spur slightly shorter than mid basal tarsal segment.

Gaster. Slightly shorter than thorax, cerci at about one-third, paratergites absent, apex of hypopygium reaching about three-quarters along gaster, ovipositor slightly exserted. Ovipositor about as long as gaster or one and a half times length of mid tibia, gonostylus about as long as mid tibial spur.

♂. Essentially similar to female except frontovertex about one-third head width, antennae with setae longer and clava entire; genitalia: digitus with two apical spines and aedeagus about two-thirds as long as mid tibia.

Papaka confusor **sp. n.**
(Figs 102, 192–196)

♀. Length: 0·86–1·17 mm (holotype 1·01 mm).

Colour. Body generally black or very dark brown, frontovertex and mesoscutum with some obscure green or brassy reflections; antenna with scape and pedicel dark brown, both yellowish white apically, first five funicle segments and clava brown, sixth funicle segment yellow; legs with coxae brown, femora brown but basally and apically yellow, tibiae and tarsi yellow, the fore tibia with a broad dark brown median band, mid and hind tibiae each with two dark brown bands, ovipositor sheaths yellow.

Head. Relative measurements of holotype: head width 55, frontovertex width at median ocellus 14, malar space 23, eye length 37, eye width 30, POL 5·5, OOL 1·5, scape length 26, proportions of antenna as in Fig. 192.

Thorax. Relative measurements of forewing of holotype: length 152, maximum width 64, length of submarginal vein 60, of marginal vein 5·5, of stigmal vein 12, of postmarginal vein 3; of hindwing: length 100, maximum width 23. Base of forewing as in Fig. 194.

Gaster. Exserted part of ovipositor equal to about one-eighth length of gaster or one-sixth mid tibia. Relative measurements of paratype: length of ovipositor 73, of gonostylus 14 [mid tibia 45, mid tibial spur 13]. Ovipositor as in Fig. 193.

♂. Length: 0·68–0·73 mm.
Antenna as in Fig. 196, genitalia as in Fig. 195. Otherwise similar to female.

DISTRIBUTION. Brazil.

BIOLOGY. Unknown.

MATERIAL EXAMINED

Holotype ♀, **Brazil**: Santa Catarina, Nova Teutonia, 14.x.1949 (*F. Plaumann*) (BMNH).

Paratypes. **Brazil**: 2 ♀, 2 ♂, Nova Teutonia, ix.1943; 1 ♀, Nova Teutonia, 31.viii.1949; 6 ♀, 1 ♂, Nova Teutonia, x.1949 (*F. Plaumann*). (BMNH; MLP, Argentina; UC, Riverside; ZI, Leningrad; PPRI, Pretoria.)

COMMENTS. One further undescribed species from Brazil (BMNH) which differs from the type-species in the relative lengths of the funicle segments, the sixth funicle segment concolorous with rest of the funicle and the exserted part of the ovipositor relatively longer.

The genus is superficially very similar to some species of *Neococcidencyrtus* and *Coccidencyrtus* but the forewing venation suggests that it is very probably more closely related to *Cicoencyrtus* and *Archinus* (Tribe Aphycini). It differs from both in having the upper tooth of the mandibles rudimentary, and in the sculpture of the mesoscutum, the relatively longer funicle segments and more densely hairy basal cell.

PARABLASTOTHRIX Mercet
(Key couplets: ♀ 91; ♂ 5. Fig 48)

Parablastothrix Mercet, 1917*c*: 538. Type-species: *Parablastothrix vespertina* Mercet, by monotypy.

Included species. Seven, one of which is found in the Neotropics: *chilensis* (Brèthes, 1919: 165) (**comb. n.** from *Archinus*), also three undetermined species from Brazil, Trinidad and St Vincent (BMNH).

Reference. Key to world species: Trjapitzin (1971: 36).

Distribution. Chile, Brazil, Trinidad, St Vincent. World: cosmopolitan.

Biology. Parasites of larvae of Lyonetiidae and Nepticulidae (Lepidoptera).

Comments. I have not seen the type of *Archinus chilensis* but, from the description, it is very probably a species of *Parablastothrix*.

Placed in the tribe Copidosomatini, subtribe Pentacnemina. The genus is very close to *Calometopia* Mercet, but differs in the female only in having a slightly narrower clava with a shorter truncation, and in the male in having one segment less with a ramus. It is quite possible that the two genera will eventually be synonymized.

PARALEUROCERUS Girault

(Key couplets: ♀ 219; ♂ 34)

Paraleurocerus Girault, 1915*c*: 172. Type-species: *Paraleurocerus bicoloripes* Girault, by monotypy.
Gibberella Miller, 1961: 496. Type-species: *Gibberella scutellata* Miller, by monotypy.

Included species. Three, one of which is found in the Neotropics: *reticulatus* (De Santis, 1964: 310) (**comb. n.** from *Ageniaspis*).

Distribution. Argentina, Brazil. World: Nearctic region.

Biology. Polyembryonic parasites of larvae of Gracillariidae (Lepidoptera).

Comments. I have examined a paratype of *Ageniaspis reticulatus*; it is clearly best placed in *Paraleurocerus*, although it is very probable that with further study the two genera will be considered synonymous.

Placed in the tribe Copidosomatini, subtribe Ageniaspidina.

PARALITOMASTIX Mercet

(Key couplets: ♀ 248; ♂ 77)

Paralitomastix Mercet, 1921: 438. Type-species: *Encyrtus varicornis* Nees, by monotypy.

Included species. Fifteen species, one of which is found in the Neotropics: *teciae* Blanchard (De Santis 1964: 290), and one undetermined species near *varicornis* (Nees) from Brazil (BMNH).

Distribution. Chile, Argentina, Brazil. World: cosmopolitan.

Biology. Polyembryonic parasites of larvae of Pyralidae and Gelechiidae (Lepidoptera).

Comments. Placed in the tribe Copidosomatini, subtribe Copidosomatina.

PARAMUCRONA gen. n.

(Key couplet: ♀ 174. Figs 85, 197, 198)

Type-species: *Paramucrona brasiliensis* sp. n.

♀. *Head.* In profile, moderately deep and most rounded level with top of antennal scrobes, frontovertex slightly convex. Eye distinctly bulging, slightly longer than broad, naked and not quite reaching occipital margin which is rounded except near middle where it is more or less sharp. Malar space slightly longer than half length of eye and with malar sulcus present, but weak. Frontovertex at narrowest point nearly half head width, ocelli forming an obtuse angle, posterior ocellus separated from occipital margin and eye margin by about its own diameter. Antennal scrobes quite shallow and not well delimited, reaching slightly more than half way between toruli and anterior ocellus; interantennal prominence relatively protuberant and rounded, reaching slightly further than dorsal margins of toruli and with a single, slightly curved line of about seven very conspicuous long, erect setae about half way between toruli and mouth margin; antennal torulus separated from mouth margin by about its own length and from other torulus by slightly more than its length. Antennal scape slightly to distinctly flattened and expanded in middle, pedicel shorter than first funicle segment, funicle six-segmented, all funicle segments longer than broad and cylindrical, clava three-segmented, about as long as fifth and sixth funicle segments together and with apex more or less rounded; longitudinal sensilla on all flagellar segments but relatively short, mostly only two to three times as long as broad, sometimes hardly longer than broad. Frontovertex with scattered inconspicuous pale setae, sculpture very shallow coriaceous becoming more longitudinally elongate on lower parts of face, except on interantennal prominence. Mandibles with three teeth, the lowest acute and the upper two slightly rounded, maxillary palpi four-segmented, labial palpi three-segmented.

Thorax. In profile moderately deep, mesoscutum and scutellum fairly flat. Mesoscutum with notaular lines weakly indicated anteriorly, otherwise absent, axillae meeting, scutellum slightly longer than broad, slightly shorter than mesoscutum, with apex pointed and produced as a short flange, propodeum medially less than one-seventh as long as scutellum. Dorsum of thorax with very shallow coriaceous sculpture, propodeum medially with one or two shallow incomplete carinae, mesopleuron smooth. Forewing hyaline, about two and a half times as long as broad, with short cilia along apical and costal margins; basal cell sparsely hairy with a bare triangle in proximal half, costal cell with one or two lines of setae dorsally which extend for about three-quarters its length to apex, speculum not interrupted and open; submarginal vein without apical hyaline break, marginal vein absent, stigmal vein arising directly from submarginal, postmarginal vein present but very short. Hindwing almost three and a half times as long as broad. Mid tibial spur slightly shorter than mid basal tarsal segment.

Gaster. Much shorter than, to nearly as long as, thorax, cerci at about one-third, ovipositor hidden or very slightly exserted, hypopygium with short apical triangular mucro (as in Fig. 84), which is at most slightly longer than mid tibial spur, but reaches apex of gaster. Ovipositor slightly shorter than mid tibia, gonostylus slightly less than half as long as mid tibial spur.

♂. Unknown.

***Paramucrona brasiliensis* sp. n.**

(Figs 85, 197, 198)

♀. Length: 1·89–2·00 mm (holotype 1·92 mm).

Colour. Body orange except posterior three-quarters of mesopleuron which is brown, and metanotum and dorsum of gaster which are slightly infuscate.

Head. Ocelli forming an angle of about 105–110°, occipital margin not sharp, only slightly acute medially. Relative measurements of holotype: head width 99, frontovertex width at median ocellus 45, malar space 29, eye length 52, eye width 44, POL 18, OOL 8, scape length 45, proportions of antennae as in Fig. 197. Longitudinal sensilla on flagellum at least twice as long as broad, some on clava five times as long as broad.

Thorax. Relative measurements of forewing of holotype: length 300, maximum width 121, length of submarginal vein 120, of stigmal vein 20, of postmarginal vein 4; of hindwing: length 176, maximum width 50. Base of forewing as in Fig. 85.

Gaster. Only slightly shorter than thorax. Relative measurements of paratype: length of ovipositor 90, of gonostylus 13 [mid tibia 112, mid tibial spur 28]; apical extension of hypopygium about as long as mid tibial spur.

♂. Unknown.

DISTRIBUTION. Brazil.

BIOLOGY. Unknown.

MATERIAL EXAMINED

Holotype ♀, **Brazil**: Santa Catarina, Nova Teutonia, 31.x.1949 (*F. Plaumann*) (BMNH).
Paratypes. **Brazil**: 2 ♀, Nova Teutonia, 30.x.1949 (*F. Plaumann*) (BMNH).

COMMENTS. Two further undescribed species from Brazil (BMNH; CNC, Ottawa) differ in relative lengths of ovipositor, gonostylus, apical extension of hypopygium, coloration, proportions of antennal segments and sharpness of occipital margin.

Belongs to the same group as *Bennettisca*, *Mucrencyrtus* and *Allencyrtus* Annecke & Mynhardt (tribe Microteryini, subtribe Microteryina), but differs from the first two by characters given in the key and from *Allencyrtus* in lacking the marginal vein, and in the pilosity of the base of the forewing, colour of body, structure of antennae, presence of costal cilia and lack of carinate extension of interantennal prominence. *Allencyrtus* has a dark, metallic body, densely pilose basal and costal cells, marginal vein present (although not reaching anterior margin of forewing), relatively short clava, costal cilia lacking and carinate extension of interantennal prominence (as in *Mucrencyrtus*).

PARECHTHRODRYINUS Girault

(Key couplets: ♀ 116, 127, 161, 192, 238; ♂ 116, 125. Figs 57, 138)

Parechthrodryinus Girault, 1916*c*: 480. Type-species: *Parechthrodryinus convexus* Girault, by monotypy.
Tyndarichoides Mercet, 1921: 649. Type-species: *Tyndarichoides metallicus* Mercet, by monotypy. [Homonym of *Tyndarichoides* Girault, 1920.]
Protyndarichus Mercet, 1922: 479. [Replacement name for *Tyndarichoides* Mercet.]

Included species. Fifteen, one of which is found in the Neotropics: *nitidus* (Howard; Noyes, 1979: 163) (**comb. n.** from *Protyndarichus*).

Distribution. Argentina, Trinidad, Grenada, Tobago, St Vincent. World: cosmopolitan.

Biology. Parasites of Lacciferidae and Pseudococcidae (Homoptera).

Comments. Placed in the tribe Cheiloneurini.

PARENCYRTUS Ashmead

Parencyrtus Ashmead, 1900: 368. Type-species: *Parencyrtus brasiliensis* Ashmead, by monotypy.

Included species. One: *brasiliensis* Ashmead, 1900: 368.

Distribution. Brazil.

Biology. Unknown.

Comments. The holotype is lost, see Kerrich (1967: 152) and Gordh & Trjapitzin (1978: 712). This genus is very possibly the same as *Rhytidothorax* or *Hemencyrtus*.

PAURIDIA Timberlake

(Key couplets: ♀ 236, ♂ 41)

Pauridia Timberlake, 1919*b*: 206. Type-species: *Pauridia peregrina* Timberlake, by monotypy.

Included species. One: *peregrina* Timberlake, 1919*b*: 208.

Distribution. Chile, Peru, Bermuda. World: Nearctic and Ethiopian regions.

Biology. Parasites of Pseudococcoidea (Homoptera).

Comments. Placed in the tribe Pauridiini.

PELMATENCYRTUS De Santis

(Key couplet: ♀ 32)

Pelmatencyrtus De Santis, 1964: 125. Type-species: *Pelmatencyrtus bonariensis* De Santis, by monotypy.

Included species. One: *bonariensis* De Santis (Kerrich, 1978: 156).

Distribution. Argentina.

Biology. Unknown.

Comments. Placed in the tribe Acroaspidiini by Trjapitzin (1973*a*), which may be correct.

PENTALITOMASTIX Eady
(Key couplets: ♀ 25; ♂ 51. Figs 15, 126)

Pseudolitomastix Eady, 1960*a*: 667. Type-species: *Pseudolitomastix nacoleiae* Eady, by monotypy. [Homonym of *Pseudolitomastix* Risbec, 1954.]
Pentalitomastix Eady, 1960*b*: 173. [Replacement name for *Pseudolitomastix* Eady.]

Included species. Five, one of which is found in the Neotropics: *plethorica* Caltagirone, 1966: 145.

Distribution. Mexico. World: Palaearctic, South East Asia.

Biology. Polyembryonic parasites of Pyralidae and Tortricidae (Lepidoptera).

Comments. Placed in the tribe Copidosomatini, subtribe Copidosomatina.

PHEIDOLOXENUS Ashmead
(Key couplet: ♀ 31)

Pheidoloxenus Ashmead, 1904: 328. Type-species: *Pheidoloxenus wheeleri* Ashmead, by monotypy.
Pheidoloxenus Girault, 1915*a*: 273. Type-species: *Pheidoloxenus wheeleri* Girault, by monotypy. [Homonym of *Pheidoloxenus* Ashmead, 1904.]
Pheidoloxeniscus Ghesquière, 1946: 369. [Replacement name for *Pheidoloxenus* Girault.]

Included species. Two: one not from the Neotropics, the other is being described from Mexico by Dr G. Gordh (=*wheeleri* sensu Mann, 1914, nec Ashmead).

Distribution. Mexico. World: Nearctic.

Biology. Reared from ant nests (Formicidae), probably parasitic on mealybugs (Homoptera: Pseudococcidae) present in nest.

Comments. Placed in the tribe Acroaspidiini.

PLAGIOMERUS Crawford
(Key couplet: ♀ 6; ♂ 7)

Plagiomerus Crawford, 1910: 89. Type-species: *Plagiomerus diaspidis* Crawford, by monotypy.
Parahomalopoda Girault, 1915*c*: 170. Type-species: *Parahomalopoda peruviensis* Girault, by monotypy. **Syn. n.**

Included species. Six, three of which are found in the Neotropics: *cyanea* (Ashmead; Dozier, 1927: 273), *diaspidis* Crawford, 1910: 90 and *peruviensis* (Girault, 1915*c*: 171) (**comb. n.** from *Parahomalopoda*); also one undetermined species from Trinidad (BMNH).

Distribution. Mexico, Cuba, Puerto Rico, Trinidad, Peru. World: Nearctic, Palaearctic and Oriental regions.

Biology. Parasites of Diaspididae (Homoptera).

Comments. *Parahomalopoda peruviensis* differs from the true *Plagiomerus* only in lacking the four lamelliform setae at the apex of scutellum. The undetermined species from Trinidad has a line of four normal setae at the apex of the scutellum. I can therefore see no case for keeping the two genera separate.

Placed in the tribe Habrolepidini, subtribe Habrolepidina.

PLATYLYCA De Santis
(Key couplet: ♀ 146. Fig. 67)

Platylyca De Santis, 1972*b*: 58. Type-species: *Platylyca quadraticeps* De Santis, by monotypy.

Included species. One: *quadraticeps* De Santis, 1972*b*: 58.

DISTRIBUTION. Argentina.

BIOLOGY. Unknown.

COMMENTS. Very probably best placed in the tribe Habrolepidini.

PRIONOMASTIX Mayr

(Key couplets: ♀ 112, 132; ♂ 67. Fig. 135)

Prionomastix Mayr, 1876: 725. Type-species: *Encyrtus morio* Dalman, by monotypy.
Liocarus Thomson, 1876: 115, 121. Type-species: *Encyrtus morio* Dalman, by monotypy.
Chestomorpha Ashmead, 1900: 370. Type-species: *Chestomorpha biformis* Ashmead, by monotypy.
Aprionomastix Girault, 1913*a*: 68. Type-species: *Aprionomastix fasciatipennis* Girault, by monotypy.

INCLUDED SPECIES. Seven, one of which is found in the Neotropics: *fasciatipennis* (Girault) (= *bicarinata* De Santis, 1964: 179), also three undetermined species from Trinidad, Ecuador and Chile (BMNH; CNC, Ottawa).

REFERENCE. Revision of world species: Annecke (1962).

DISTRIBUTION. Argentina, Paraguay, Ecuador, Chile, Trinidad. World: cosmopolitan.

BIOLOGY. Parasites of nymphs of Membracidae (Homoptera).

COMMENTS. Placed in the tribe Prionomasticini, subtribe Prionomasticina.

One undetermined species from Trinidad (CNC, Ottawa) (not included above) falls between *Prionomastix* and *Hexacladia*. The structure of the thorax is close to that of *Prionomastix* but the antennae are typical of *Hexacladia*. On this evidence I believe that the two subtribes Prionomasticina and Hexacladiina should be considered the same.

PRIONOMITUS Mayr

Prionomitus Mayr, 1876: 701. Type-species: *Encyrtus chlorinus* Dalman, by monotypy.

INCLUDED SPECIES. Ten, one of which is found in the Neotropics: *fuscipalpis* Kieffer (*in* Kieffer & Jörgensen, 1910: 413).

DISTRIBUTION. Argentina. World: Palaearctic region, India.

BIOLOGY. Parasites of nymphs of Psyllidae (Homoptera) (in Europe).

COMMENTS. The holotype ♂ of *fuscipalpis* is apparently lost, but from the original description and biology it is quite unlikely that it is correctly placed in *Prionomitus*. It may be a *Cerchysius*.

Howard (*in* Riley *et al.*, 1894: 97) recorded *Prionomitus tiliaris* (Dalman) from St Vincent. There is one specimen of the original Smith collection from St Vincent labelled as this species by Howard in the BMNH. It is a female *Psyllaephagus rotundiformis* (Howard).

PROCHILONEURUS Silvestri

(Key couplets: ♀ 58, 95, 107; ♂ 136. Fig. 35)

Prochiloneurus Silvestri, 1915*b*: 350. Type-species: *Prochiloneurus pulchellus* Silvestri, by monotypy.
Achrysopophagus Girault, 1915*d*: 89. Type-species: *Achrysopophagus oviductus* Girault, by original designation.
Parachrysopophagus Agarwal, 1965: 65. Type-species: *Achrysopophagus insolitus* Alam, by original designation.
Neoprochiloneurus Viggiani, 1966: 95. Type-species: *Prochiloneurus bolivari* Mercet, by monotypy.

INCLUDED SPECIES. Twenty-nine, four of which are found in the Neotropics: *dactylopii* (Howard) (=*argentinensis* De Santis, 1964: 357. **Syn. n.**), *io* (Girault, 1920: 187), *rex* (Girault, 1920: 188) and *seini* (Dozier, 1927: 269); also three undetermined species (BMNH; USNM, Washington).

DISTRIBUTION. Throughout the Neotropics. World: cosmopolitan.

Biology. Hyperparasites via other encyrtids parasitizing various families of Coccoidea (Homoptera), mainly Pseudococcidae and Coccidae, and Coccinellidae (Coleoptera).

Comments. I have labelled one syntype female of *Cheiloneurus dactylopii* as LECTOTYPE (USNM, Washington). It is labelled as follows: '1170^{01}, Cotype 2641 USNM, "*Cheiloneurus dactylopii* How. ♀ Cotype."'

Placed in the tribe Cheiloneurini.

PROTYNDARICHOIDES gen. n.

(Key couplet: ♀ 193. Figs 199–201)

Type-species: *Protyndarichoides nigriceps* sp. n.

♀. *Head.* In side view moderately deep, with frontovertex and face more or less gradually curved, but slightly angled just above antennal scrobes. Eye about one-third longer than broad, clothed with a few short inconspicuous pale setae and reaching occipital margin which is sharp. Malar space about two-thirds length of eye and with malar sulcus present. Frontovertex about one-third head width, ocelli forming a slightly acute angle, posterior ocellus separated from occipital margin by less than its own diameter and from eye margin by one half to slightly more than its own diameter. Antennal scrobes shallow and short, not reaching half way from antennal toruli to anterior ocellus and separated dorsally by interantennal prominence which is confluent with frontovertex; antennal torulus separated from mouth margin by slightly more than its own length and from other torulus by about twice its length, its upper margin well below lowest margin of eye. Scape subcylindrical, pedicel conical and about as long or longer than the first two funicle segments together, funicle six-segmented, cylindrical and widening distally, clava three-segmented, about half as long as, and slightly broader than funicle, with a short, oblique, apical truncation; longitudinal sensilla on all flagellar segments except first two. Frontovertex with shallow coriaceous sculpture which becomes shallower and more elongate between eyes and antennal scrobes and on lower parts of face and genae. Frontovertex with a few scattered brown setae, more dense on interantennal prominence. Mandibles with three acute teeth, maxillary palpi four-segmented, labial palpi three-segmented.

Thorax. In side view moderately deep with mesoscutum and scutellum quite flat. Mesoscutum without notaular lines, about a half broader than long, axillae more or less touching, scutellum slightly longer than broad, flat and with apex rounded, propodeum medially about one-quarter as long as scutellum. Pronotum, mesoscutum and axillae with shallow coriaceous sculpture, scutellum with deep, regular, reticulate sculpture but smooth at extreme apex and sides, sculpture on mesopleuron very shallow, elongate anteriorly and more or less reticulate posteriorly, propodeum with a few longitudinal carinae medially and spiracles more or less enclosed by three carinae. Forewing hyaline, slightly less than three times as long as broad; basal cell naked in proximal half, speculum not interrupted and open; submarginal vein slightly expanded apically and with an apical hyaline break, marginal vein about four to five times as long as broad, about twice as long as stigmal which is about as long as postmarginal. Hindwing about five times as long as broad. Mid tibial spur about as long as corresponding basitarsus.

Gaster. About two-thirds as long as thorax, with cerci about half way along, paratergites absent, hypopygium nearly reaching apex of gaster, ovipositor very slightly exserted. Ovipositor short, about half as long as mid tibia, gonostyli slightly less than half length of mid tibial spur.

♂. Unknown.

Protyndarichoides nigriceps sp. n.

(Figs 199–201)

♀. Length: 1·06 mm.

Colour. Frontovertex blackish, face and genae blackish with metallic green and purple reflections; scape, pedicel and first five funicle segments yellow, sixth funicle segment and clava black; thorax largely reddish orange except pronotum, anterior margin of mesoscutum and scutellum which are dark brown with some dark green reflections, legs completely yellow except fore and mid coxae which are yellowish white; gaster black dorsally, except basal tergite which is orange with two dark spots laterally, basal half of ventral surface of gaster orange, distal half black.

Head. Posterior ocellus separated from occipital margin by slightly less than its own diameter and from eye margin by about half of its own diameter. Relative measurements of holotype: head width 59, frontovertex width at anterior ocellus 20·5, malar space 25, eye length 37, eye width 30, POL 8, OOL 2, scape length 35, proportions of antenna as in Fig. 200.

Thorax. Mid tibial spur slightly shorter than corresponding basal tarsal segment. Relative measurements of forewing of holotype: length 174, maximum width 63, length of submarginal vein 71, of marginal vein 14, of stigmal vein 7, of postmarginal vein 5·5. Base of forewing as in Fig. 199.

Gaster. Relative measurements of paratype: length of ovipositor 28, of gonostylus 6 [mid tibia length 52, mid tibial spur length 12·5]. Ovipositor as in Fig. 201.

♂. Unknown.

DISTRIBUTION. Trinidad, Tobago.

BIOLOGY. Unknown.

MATERIAL EXAMINED

Holotype ♀, **Trinidad**: St George, Caura, 2.viii.1976 (*J. S. Noyes*) (BMNH).
Paratype. **Tobago**: 1 ♀, Mt Irvine Bay, 19.vii.1976 (*J. S. Noyes*) (BMNH).

COMMENTS. Also examined, one further undescribed species from Brazil (BMNH).

In some respects this genus is similar to *Rhytidothorax*, i.e. in the flat scutellum, the relatively long propodeum and the short ovipositor. However, the forewing venation suggests a close affinity to the genera included in the tribe Cheiloneurini, and it may be closest to *Parechthrodryinus*. This is suggested by the structure of the scutellum, propodeum and venation, although the relatively short gaster and ovipositor distinguish it.

PSEUDAPHYCUS Clausen
(Key couplets: ♀ 19; ♂ 24)

Pseudaphycus Clausen, 1915: 41. Type-species: *Aphycus angelicus* Howard, by monotypy.
Psilomirinus Brèthes, 1916*b*: 424. Type-species: *Psilomirinus flavidulus* Brèthes, by monotypy.

INCLUDED SPECIES. Twenty-three, eleven of which are found in the Neotropics: *abtrusus* Gahan, *angelicus* (Howard), *angustifrons* Gahan, *dysmicocci* Bennett, *ferrisianae* Bennett, *flavidulus* (Brèthes), *griseus* De Santis, *mundus* Gahan, *perdignus* Compere & Zinna, 1955: 105, *prosopidis* Timberlake and *utilis* Timberlake; also two undetermined species from Trinidad and Brazil (BMNH).

REFERENCES. Revision: Gahan (1946); see also Bennett (1955) and De Santis (1964: 150–161).

DISTRIBUTION. Throughout the Neotropics. World: cosmopolitan.

BIOLOGY. Parasites of Pseudococcidae (Homoptera).

COMMENTS. Placed in the tribe Aphycini, subtribe Aphycina. It is very close to *Acerophagus* and *Timberlakia* from which it can be separated using the characters given in the key.

PSEUDHOMALOPODA Girault
(Key couplets: ♀ 6; ♂ ?7)

Pseudhomalopoda Girault, 1915*c*: 171. type-species: *Pseudhomalopoda prima* Girault, by monotypy.

INCLUDED SPECIES. Four, one of which is found in the Neotropics: *prima* Girault, 1915*c*: 171.

DISTRIBUTION. Mexico, West Indies. World: Australia, Indonesia, Japan, Hawaii.

BIOLOGY. Parasites of Diaspididae (Homoptera).

COMMENTS. Placed in the tribe Habrolepidini, subtribe Habrolepidina.

PSYLLAEPHAGUS Ashmead

(Key couplets: ♀ 171, 198, 254; ♂ 82. Figs 72, 73, 75, 78)

Psyllaephagus Ashmead, 1900: 382. Type-species: *Encyrtus pachypsyllae* Howard, by original designation.
Mirocerus Ashmead, 1904: 309. Type-species: *Mirocerus pyelae* Ashmead, by monotypy.
Calluniphilus Erdös, 1961: 413. Type-species: *Calluniphilus vendicus* Erdös, by monotypy.
Ooencyrtoides Hoffer, 1963: 568. Type-species: *Ooencyrtus albopilosus* Hoffer, by original designation.
Propsyllaephagus Blanchard *in* De Santis, 1964: 235. Type-species: *Propsyllaephagus trellesi* Blanchard, by monotypy.
Mercetia Bakkendorf, 1965: 139. Type-species: *Copidosoma lusitanicum* Mercet, by monotypy.
Kaszabicyrtus Szelenyi, 1971: 389. Type-species: *Kaszabicyrtus acutigastris* Szelenyi, by original designation.

Included species. One hundred and four, two of which are found in the Neotropics: *rotundiformis* (Howard; Noyes, 1979: 165) and *trellesi* (Blanchard; De Santis, 1964: 236); also four undetermined species from Cuba and Brazil (BMNH).

Distribution. Argentina, Brazil, Trinidad, Tobago, St Vincent, Cuba. World: cosmopolitan.

Biology. Parasites of nymphs of Psyllidae (Homoptera).

Comments. The generic placement of *trellesi* is not too clear since all the types are badly mounted on slides. Trjapitzin (pers. comm.) believes that it may be an *Aphidencyrtus* (sometimes parasitic on psyllid nymphs), but the wing venation indicates that it is best accommodated in *Psyllaephagus*. Placed in the tribe Trechnitini, subtribe Metaprionomitina. The two genera most easily confused with it in the Neotropics are *Aphidencyrtus* and *Ooencyrtus* (tribe Microteryini) which can be distinguished by the characters given in the key.

RHOPUS Förster

(Key couplets: ♀ 37, 72, 208, 214; ♂ 86, 94. Fig. 19)

Rhopus Förster, 1856: 34. Type-species: *Encyrtus piso* Walker, by monotypy.
Xanthoencyrtus Ashmead, 1902: 302. Type-species: *Xanthoencyrtus nigroclavatus* Ashmead, by monotypy.
Scelioencyrtus Girault, 1915*d*: 161. Type-species: *Scelioencyrtus nigriclavus* Girault, by original designation.
Mirastymachus Girault, 1915*d*: 166. Type-species: *Mirastymachus europaeus* Girault, by original designation.
Pholidoceras Mercet, 1918: 237. Type-species: *Pholidoceras brachyptera* Mercet, by monotypy.
Pholidocerodes Ferrière, 1956: 358. Type-species: *Pholidoceras parvula* Mercet, by monotypy.

Included species. Forty-one, two of which are found in the Neotropics: *desantisellus* Ghesquière, 1957: 18 and *nigroclavatus* (Ashmead, 1902: 302).

Distribution. Argentina. World: cosmopolitan.

Biology. Parasites of Pseudococcidae (Homoptera).

Comments. Placed in the tribe Anagyrini, subtribe Rhopina.

RHYTIDOTHORAX Ashmead

(Key couplets: ♀ 85, 120, 133, 164, 191, 209, 226, 237; ♂ 45, 93. Figs 54–56, 121)

Rhytidothorax Ashmead, 1900: 377. Type-species: *Rhytidothorax marlatti* Ashmead, by monotypy.

Included species. Six, five of which are found in the Neotropics: *bollowi* (Mercet, 1928: 10) (**comb. n.** from *Parencyrtus*), *flaviclava* (De Santis, 1964: 95) (**comb. n.** from *Parastenoterys*), *flavicornis* (De Santis, 1967: 74) (**comb. n.** from *Parastenoterys*), *hirtus* (Howard; Noyes, 1979: 159) (**comb. n.** from *Encyrtus*) and *perhispidus* (De Santis, 1964: 97) (**comb. n.** from *Parastenoterys*); also at least 25 undetermined species (BMNH; CNC, Ottawa).

Distribution. Argentina, Brazil, Panama, Ecuador, West Indies. World: Nearctic region, ?Africa, Australia.

BIOLOGY. Unknown.

COMMENTS. I have examined the holotype ♀ of *Rhytidothorax marlatti.* In my opinion it is congeneric with the South American species previously incorrectly placed in *Parastenoterys* Girault (this genus is distinct from *Rhytidothorax*) and differs only in the shape of the head (similar in shape to *Simondsiella*, Figs 82, 83) and in having stronger setigerous punctures on the frontovertex. The shape of the head of the South American species varies greatly and in most it it relatively deep, although some do approach that of *marlatti.* A few also have well-marked setigerous punctures on the frontovertex. The genus also occurs in Australia and Africa except that the African species appear to have a short third (upper) tooth.

The genus appears to be morphologically diverse; in some groups of species the head is very deep and almost similar in shape to some *Hunterellus*, and the fore tibia is quite expanded and flattened with the apical tarsal segment from slightly to greatly enlarged. In this group also, the funicle segments are relatively short and the frontovertex and scutellum are sometimes highly polished, although occasionally quite deeply sculptured. This group is perhaps the most self-contained, although it is difficult to reliably separate it from *Rhytidothorax*. The group includes *perhispidus*, *flavicornis* and *hirtus*. The other main group contains species with a shallower head, more deeply sculptured scutellum and longer funicle segments. At either extreme the species are very different, but taken as a whole it seems that they would all be best placed in a single genus. All species have the eyes and frontovertex with long conspicuous setae, the mandibles unidentate or bidentate (upper tooth relatively long) or perhaps with a very short third (upper) tooth, the scutellum flat and in larger species with a very fine apical carina with two upright setae at apex, a relatively long propodeum, medially at least one-sixth as long as the scutellum and with distinct sculpture, a short ovipositor about half the length of the gaster and a hypopygium which does not reach the apex of the gaster. In addition the antenna is quite characteristic: pedicel relatively long, first funicle segment relatively long and following segments progressively becoming shorter.

Trjapitzin & Gordh (1978*b*) place the genus in the tribe Bothriothoracini, subtribe Bothriothoracina, which I believe is incorrect. The marginal vein is relatively long, the hypopygium does not extend to the apex of the gaster and the mandibles are narrower and usually only with one or two very unequal teeth. The characters are conflicting with those given by Trjapitzin for this tribe.

SHENAHETIA gen. n.

(Key couplets: ♀ 74, 221; ♂ 129. Figs 41, 137, 202–206)

Type-species: *Shenahetia masneri* sp. n.

♀. *Head.* In side view similar to that of *Mariola* (Fig. 42), very shallow, hardly convex and prognathous, the occipital foramen situated more than half way up head. Eye about one half times longer than broad, with short to moderately long hairs and nearly reaching occipital margin which is acute. Malar space about half length of eye with malar sulcus absent. Frontovertex just greater than half head width; ocelli forming an obtuse angle, posterior ocellus situated less than its own diameter from occipital margin and about its own diameter from eye margin. Antennal scrobes very shallow and short (Fig. 41), not as long as an antennal torulus; antennal torulus situated almost at mouth margin and separated from other torulus by about two and a half to three times its own length. Scape subcylindrical or foliaceously flattened, pedicel conical and about half as long as funicle which is six-segmented, all segments transverse, broadening apically and more or less cylindrical, clava two-segmented, broader than funicle and rounded apically; longitudinal sensilla on fifth and sixth funicle segments and clava. Frontovertex with a few sparse setae, sculpture absent or extremely shallow and irregular so that it has a polished appearance. Mandibles narrow, with three acute teeth, the middle the longest, maxillary palpi four-segmented, labial palpi three-segmented.

Thorax. In side view quite shallow and dorsally flattened. Mesoscutum without notaular lines, about one half broader than long, axillae almost meeting, scutellum slightly broader than long with apex rounded and produced as a short flange, propodeum not more than one-fifth as long as scutellum. Pronotum and mesoscutum with very shallow shagreened sculpture, scutellum devoid of sculpture and highly polished, propodeum smooth except for some very shallow sculpture medially. Forewing hyaline or slightly infumate, about two and a half times as long as broad; basal cell sparsely hairy and naked in its proximal one-third, speculum not interrupted and open; submarginal vein slightly expanded apically and with an apical hyaline break, marginal vein about three times as long as broad, stigmal slightly shorter, postmarginal very short. Mid tibial spur about as long as mid basal tarsal segment.

Gaster. About one-half longer than thorax, cerci at about two-fifths along gaster, paratergites absent, hypopygium extending past apex of gaster so that it is clearly visible in dorsal view, exserted part of ovipositor about half as long as gaster and with sheaths distinctly downcurved apically. Ovipositor (Fig. 206) about twice as long as mid tibia with gonostylus slightly longer than mid tibia.

♂. Body moderately dorso-ventrally flattened. Antennal scrobes semicircular, slightly longer than in female, antennal torulus just less than its own length from mouth margin and separated from other torulus by about its own length; antenna with pedicel about as long as first two funicle segments together, funicle segments about as long as broad or slightly longer than broad and clothed with setae which are more than twice as long as diameter of segments, clava entire, longitudinal sensilla present on sixth funicle segment and clava. Gaster slightly shorter than thorax; aedeagus about half as long as mid tibia and digiti each with one apical spine.

Shenahetia masneri **sp. n.**
(Figs 41, 137, 202–205)

♀. Length (excluding ovipositor): 0·92–1·00 mm (holotype 1·00 mm).

Colour. Body dark brown with some purplish and golden reflections on face and thorax, basal tergite of gaster with bluish green reflections; scape and pedicel testaceous with dorsum of scape and basal half of pedicel pale brown, flagellum brown; legs testaceous yellow, except the following which are brown: fore and hind femora, distal half of mid femur, extreme base of each tibia and apical segment of hind tarsus; forewing hyaline; occasionally ovipositor sheaths paler towards base, but usually pale brown.

Head. Frontovertex with extremely shallow, fine, shagreened sculpture which is slightly deeper and more irregular between ocelli and more elongate on genae; a few scattered setae near ocelli, along inner eye margins, on clypeus and genae; ocelli forming an angle of about 115°; eyes clothed in short pale setae; fifth funicle segment without longitudinal sensilla. Relative measurements of paratype: head width 46, frontovertex width at anterior ocellus 25, malar space 13, eye length 28, eye width 18, scape length 21, proportions of antennae as in Fig. 202.

Thorax. Dorsum of thorax with a few scattered dark setae on pronotum and mesoscutum, scutellum with fewer setae; mid tibial spur shorter than mid basal tarsal segment. Relative measurements of forewing of paratype: length 120, maximum width 43, length of submarginal vein 45, of marginal vein 6·5, of stigmal vein 5, of postmarginal vein 1; of hindwing: length 85, maximum width 15. Base of forewing as in Fig. 203.

Gaster. Exserted part of ovipositor about three-quarters as long as mid tibia or nearly half as long as gaster. Relative lengths of paratype: length of ovipositor 78, of gonostylus 33 (mid tibia 40).

♂. Length: 0·75–1·00 mm.
Similar to female except for antenna (Fig. 204) and genitalia (Fig. 205). Relative measurements of paratype: head width 47, frontovertex width at anterior ocellus 26·5, scape length 19·5, proportions of antennae as in Fig. 204, length of hindwing 80, width of hind wing 20.

DISTRIBUTION. Trinidad.

BIOLOGY. Unknown.

MATERIAL EXAMINED

Holotype ♀, **Trinidad**: St George, Chaguaramas Bay, 16.vii.1976 (*J. S. Noyes*) (BMNH).

Paratypes. **Trinidad**: 4 ♀, Curepe, Santa Margarita Circular Road, iii–iv.1974, Moericke trap; 2 ♂, Curepe, Santa Margarita Circular Road, 24.v.–8.vi.1974 and 15–27.ix.1974, Moericke trap (*F. D. Bennett*); 1 ♂, Caroni, Gran Couva, 27.vi.1976 (*J. S. Noyes*). (BMNH; CNC, Ottawa.)

COMMENTS. I have also examined one other undescribed species from Trinidad which differs from the type-species in having the scape broadened and flattened, the frontovertex with conspicuous setae and the forewings slightly infumate.

The genus is similar in appearance to some species of *Avetianella* and *Szelenyiola* but differs in lacking the membranous lines on the frontovertex. It is very probably closely related to *Tanyencyrtus* from which it can be separated by the characters given in the key.

Probably best placed in the tribe Microteryini near the subtribes Oobina and Platencyrtina.

Named in honour of Dr L. Masner.

SIMMONDSIELLA gen. n.

(Key couplet: ♀ 170. Figs 81–83, 207)

Type-species: *Simmondsiella flaviptera* sp. n.

♀. *Head.* In side view relatively shallow, similar to *Trichomasthus* but rather more evenly curved. Eye about one-third longer than broad, with a few very short hairs and overreaching occipital margin which is sharp. Malar space about half as long as eye, with malar sulcus present but weak. Frontovertex about one-quarter head width; ocelli forming an acute angle of about 60°, posterior ocellus separated from occipital margin by about its own diameter and from eye margin by less than half its diameter. Antennal scrobes semicircular, shallow and short, meeting dorsally but not reaching half way between antennal toruli and anterior ocellus, antennal torulus separated from mouth margin and other torulus by about its own length, its dorsal margin about level with lowest margin of eyes. Antennal scape subcylindrical and with two very strong, conspicuous setae on outer face near apex, pedicel conical and longer than first funicle segment, funicle six-segmented, all segments longer than broad, cylindrical and slightly widening distally, clava three-segmented and with apex rounded. Frontovertex with regular, reticulate, almost punctiform sculpture, becoming shallower and more irregular on lower parts of face and genae, a few sparse setae present. Mandibles with two acute teeth and a broad truncation which is about as broad as the two teeth together across their bases.

Thorax. Moderately deep in side view and dorsally convex. Mesoscutum without notaular lines, about twice as broad as long, axillae widely separated by posterior margin of mesoscutum, scutellum slightly wider than long, evenly convex and with apex rounded, propodeum medially about one-eighth as long as scutellum. Pronotum, mesoscutum and axillae with shallow coriaceous sculpture, scutellum with basal half similar but sculpture more regular and tending towards punctiform, apical half completely smooth and polished, mesopleuron with raised elongate sculpture anteriorly becoming more regular and reticulate posteriorly, propodeum with shallow, irregular sculpture medially. Forewing hyaline, slightly more than twice as long as broad; basal cell sparsely pilose and naked in proximal third, speculum not interrupted and open; submarginal vein with an apical hyaline break, marginal vein punctiform, stigmal vein about as long as marginal and postmarginal veins together. Mid tibial spur about as long as mid basitarsus.

Gaster. Slightly shorter than thorax and with cerci in basal third, ovipositor only slightly protruding, apex of hypopygium about two-thirds along gaster.

♂. Unknown.

Named in honour of Dr F. J. Simmonds.

Simmondsiella flaviptera sp. n.

(Figs 81–83, 207)

♀. Length: 1·24 mm.

Colour. Frontovertex dark purplish green, paler and more shiny on antennal scrobes, interantennal prominence and cheeks below eyes tinged coppery; antenna testaceous with basal half of pedicel and dorsum of scape brown; pronotum and mesoscutum with long, dark brown setae, pronotum, mesoscutum, axillae and anterior half of scutellum dark purplish brown; apical half of scutellum very shiny deep blue mixed with purple, mesopleuron brown; coxae and femora brown, mid and hind femora with apices yellow, tibiae and tarsi yellow; forewings faintly suffused yellow, particularly towards base; gaster with basal tergite dark metallic green, other tergites coppery mixed metallic pale green.

Head. Relative measurements (Figs 82, 83): head width 101, frontovertex width at anterior ocellus 26, malar space 31, eye length 64, eye width 48, POL 14, OOL 2, scape length 42, proportions of antenna as in Fig. 207.

Thorax. Relative measurements of forewing (Fig. 81): length 222, maximum width 100, length of submarginal vein 88, of marginal vein 6, of stigmal vein 15·5, of postmarginal vein 9·5; of hind wing: length 148, maximum width 43.

♂. Unknown.

Distribution. Brazil.

Biology . Unknown.

Material examined

Holotype ♀, **Brazil**: Santa Catarina, Nova Teutonia, 25.viii.1944 (*F. Plaumann*) (BMNH).

Comments. Close to *Trichomasthus* and *Hadrencyrtus* Annecke & Mynhardt (tribe Microteryini, subtribe Microteryina). It differs from both in having a punctiform marginal vein, and from *Hadrencyrtus* in having subhyaline forewings, eyes overreaching the occipital margin, a shorter malar space and long setae on the antennal flagellum. Both *Trichomasthus* and *Hadrencyrtus* have relatively long marginal veins (usually at least three times as long as broad) and *Hadrencyrtus* has infuscate forewings, eyes only just reaching occipital margin, a longer malar space (about three-quarters of the length of the eye) and the setae on the antennal flagellum very short.

SOLENAPHYCUS De Santis

(Key couplets: ♀ 9, 25; ♂ 13. Fig. 8)

Solenaphycus De Santis, 1972*b*: 54. Type-species: *Solenaphycus vianai* De Santis, by monotypy.

Included species. One: *vianai* De Santis, 1972*b*: 54.

Distribution. Argentina.

Biology. Unknown.

Comments. I am unable to place the genus according to Trjapitzin's (1973*b*) classification of the Encyrtidae.

SOLENOENCYRTUS De Santis

(Key couplet: ♀ 232)

Solenoencyrtus De Santis, 1964: 207. Type-species: *Solenoencyrtus platensis* De Santis, by monotypy.

Included species. One: *platensis* De Santis, 1964: 207.

Distribution. Argentina.

Biology. Unknown.

Comments. Possibly related to *Metaphycus* (tribe Aphycini, subtribe Paraphycina).

STEMMATOSTERES Timberlake

(Key couplets: ♀ 9; ♂ 14. Fig. 11)

Stemmatosteres Timberlake, 1918: 352. Type-species: *Stemmatosteres apterus* Timberlake, by monotypy.

Included species. Three, one of which is found in the Neotropics: *apterus* Timberlake, 1918: 354.

Distribution. Uruguay. World: Nearctic region, Europe.

Biology. Parasites of Pseudococcidae (Homoptera).

Comments. Placed in the tribe Aphycini, subtribe Aphycina.

SYRPHOPHAGUS Ashmead

(Key couplets: ♀ 176, 205, 259; ♂ 84, 121, 123, 140. Fig. 79)

Syrphophagus Ashmead, 1900: 397. Type-species: *Encyrtus mesograptae* Ashmead, by original designation.
Echthrobaccha Perkins, 1906: 253. Type-species: *Echthrobaccha injuriosa* Perkins, by monotypy.
Syrphidencyrtus Blanchard, 1940: 107. Type-species: *Syrphidencyrtus bacchae* Blanchard, by monotypy. **Syn. n.**

Included species. Twenty-nine, six of which are found in the Neotropics: *bacchae* (Blanchard) (**comb. n.** from *Syrphidencyrtus*), *flavitibiae* (De Santis) (**comb. n.** from *Syrphidencyrtus*), *nigricornis* (De Santis) (**comb. n.** from *Syrphidencyrtus*), *nubeculus* De Santis, *quadrimaculati* (Ashmead, 1881: 171) and *silvai* (Brèthes, 1921*a*: 8), also three undetermined species from Trinidad and Brazil (BMNH).

Reference. De Santis (1964: 128–135, 194).

Distribution. Argentina, Chile, Brazil, Trinidad, Puerto Rico. World: cosmopolitan.

Biology. Parasites of larvae of Syrphidae (Diptera).

Comments. I have examined a specimen determined by De Santis as *Syrphidencyrtus bacchae. Syrphophagus flavitibiae* may be out of place in this genus since the scutellum appears to be very flat and shiny but this may be because the holotype is slide mounted and the specimen slightly flattened by the pressure of the coverslip.

The genus is close to *Aphidencyrtus* and they are sometimes almost impossible to separate, except on relative size, unless the host is known. I believe that the two genera should eventually be synonymized.

Placed in the tribe Microteryini, subtribe Syrphophagina.

SZELENYIOLA Trjapitzin
(Key couplets: ♀ 213; ♂ 58. Fig. 95)

Szelenyiola Trjapitzin, 1977: 160. Type-species: *Szelenyiola nearctica* Trjapitzin, by monotypy.

Included species. One, not found in the Neotropics, but one undescribed species from Brazil (BMNH).

Distribution. Brazil. World: Nearctic.

Biology. Probably parasitic on eggs of Buprestidae or Scolytidae (Coleoptera).

Comments. Placed in the tribe Microteryini, subtribe Oobiina.

TACHARDIOBIUS Timberlake
(Key couplets: ♀ 195; ♂ 56. Fig. 93)

Tachardiobius Timberlake, 1926: 19. Type-species: *Tachardiobius nigricans* Timberlake, by monotypy.

Included species. Two, one of which is found in the Neotropics: *silvestrii* De Santis, 1956: 188.

Distribution. Argentina. World: Nearctic region.

Biology. Parasites of Lacciferidae (Homoptera).

Comments. The South American species is very close to the type-species, but differs in having more extensive pale markings on the face, two lateral white spots on the base of the gaster and paler legs.

Placed in the tribe Aphycini, subtribe Paraphycina by Trjapitzin & Gordh (1978*b*).

TANYENCYRTUS De Santis
(Key couplets: ♀ 74, 221; ♂ 129. Fig. 139)

Tanyencyrtus De Santis, 1972*b*: 57. Type-species: *Tanyencyrtus divisus* De Santis, by monotypy.

Included species. One: *divisus* De Santis, 1972*b*: 57.

Distribution. Argentina.

Biology. Parasites of fruit-mining larvae of Lepidoptera.

Comments. See comments under *Shenahetia*.

TETARTICLAVA gen. n.

(Key couplet: ♀ 23. Figs 16, 208, 209)

Type-species: *Tetarticlava yoshimotoi* sp. n.

♀. *Head.* In side view, moderately deep, most rounded level with top of antennal scrobes, frontovertex slightly convex. Eye about one-third longer than broad, hairy and reaching occipital margin which is acute. Malar space slightly longer than half length of eye and with malar sulcus present. Frontovertex at narrowest point about one-third head width; ocelli forming an acute angle of about 60°, posterior ocellus separated from occipital and eye margins by less than its own diameter. Antennal scrobes moderately impressed, reaching much further than half way from antennal toruli to anterior ocellus and joined dorsally; antennal torulus slightly more than its own length from mouth margin and nearly twice its own length from other torulus, its upper margin slightly below lowest margin of eye. Scape subcylindrical and stout, pedicel longer than first two funicle segments together, funicle five-segmented, all segments transverse and cylindrical, broadening distally, clava four-segmented, nearly as long as funicle and with apex slightly pointed; longitudinal sensilla on all flagellar segments except the first two. Frontovertex with fairly conspicuous dark setae, sculpture shallow coriaceous, more transversely elongate between anterior ocellus and top of antennal scrobes, becoming more longitudinally elongate on cheeks. Mandibles with two acute teeth and a rudimentary third (lowest) tooth, the middle tooth much the longest; maxillary palpi four-segnented, labial palpi three-segmented.

Thorax. In side view, moderately deep with mesoscutum and scutellum fairly convex. Mesoscutum without notaular lines and about twice as broad as long, axillae meeting, scutellum slightly broader than long, propodeum medially about one-eighth as long as scutellum. Pronotum, mesoscutum, axillae and scutellum with shallow coriaceous sculpture, except on scutellum where it is distinctly deeper, mesopleuron with irregular, shallow, coriaceous sculpture, propodeum medially quite smooth. Forewing hyaline, but with some slight infumation in basal cell, slightly more than twice as long as broad; basal cell sparsely hairy with a completely naked triangular area proximally, speculum not interrupted and open; submarginal vein with an apical hyaline break, marginal vein about two to three times as long as broad, about as long as stigmal and slightly longer than postmarginal. Hindwing nearly four times as long as broad. Mid tibial spur about as long as mid basal tarsal segment.

Gaster. Slightly shorter than thorax, cerci in basal third, hypopygium reaching apex of gaster, ovipositor not or hardly protruding. Ovipositor about as long as gaster or slightly longer than mid tibia, gonostylus about one-third as long as mid tibia.

♂. Unknown.

Tetarticlava yoshimotoi sp. n.

(Figs 16, 208, 209)

♀. Length: 0·73–0·89 mm (holotype 0·81 mm).

Colour. Body black with faint green, purple and brassy reflections; antennae brown, legs brown except for tarsi and apex of mid tibia which are testaceous.

Head. Relative measurements of holotype: head width 55, frontovertex width at anterior ocellus 21, malar space 23, eye length 35·5, eye width 26, POL 7·5, OOL 3·5, scape length 26, proportions of antenna as in Fig. 16.

Thorax. Relative measurements of forewing of holotype: length 126, maximum width 57, length of submarginal vein 52, of marginal vein 9, of stigmal vein 8·5, of postmarginal vein 6·5; of hindwing: length 88, maximum width 24. Base of forewing as in Fig. 208.

Gaster. Relative measurements of paratype: length of ovipositor 67, of gonostylus 18 [mid tibia 55]. Ovipositor as in Fig. 209.

♂. Unknown.

Distribution. Trinidad, St Vincent.

Biology. Unknown.

Material examined

Holotype ♀, **Trinidad**: St George, Lopinot, 10.viii.1976 (*J. S. Noyes*) (BMNH).

Paratypes. **Trinidad**: 1 ♀, Curepe, Santa Margarita, Circular Road, 25.x.–7.xii.1974 (*M. N. Beg*). **St Vincent**: 1 ♀, Richmond, 10.vii.1976 (*J. S. Noyes*). (BMNH; CNC, Ottawa.)

Comments. The genus bears some resemblance to *Forcipestricis* and is possibly related. It differs in the antennal structure and the lack of tubercles on the scutellum. I am unable to place it according to Trjapitzin's (1973*b*) classification of the Encyrtidae.

Named in honour of Dr C. Yoshimoto.

TETRACNEMOIDEA Howard
(Key couplets: ♀ 27, ♂ 3. Fig. 24)

Tetracnemoidea Howard, 1898*b*: 232. Type-species: *Tetracnemoidea australiensis* Howard, by monotypy.
Tetracnemopsis Ashmead, 1900: 358. Type-species: *Tetracnemus westwoodi* Cockerell, by monotypy.
Arhopoideus Girault, 1915*d*: 174. Type-species: *Arhopoideus brevicornis* Girault, by original designation.
Hungariella Erdös, 1946: 144. Type-species: *Hungariella piceae* Erdös, by monotypy.

Included species. Sixteen, two of which are found in the Neotropics: *peregrina* (Compere) (**comb. n.** from *Arhopoideus*) and *brevicornis* (Girault) (= *pretiosus* Timberlake) (**comb. n.** from *Arhopoideus*).

Reference. World revision: Kerrich (1967: 154–166).

Distribution. Brazil, Argentina, Chile, Trinidad, Bermuda. World: cosmopolitan.

Biology. Parasites of Pseudococcidae (Homoptera).

Comments. Placed in the tribe Tetracnemini, subtribe Arhopoideina.

TETRACNEMUS Westwood
(Key couplets: ♀ 43; ♂ 4. Fig. 25)

Tetracnemus Westwood, 1837: 258. Type-species: *Tetracnemus diversicornis* Westwood, by monotypy.
Tetracladia Howard, 1892: 367. Type-species: *Tetracladia texana* Howard, by designation of Ashmead, 1900: 358.
Tetralophidea Ashmead, 1900: 348. Type-species: *Tetralophidea bakeri* Ashmead, by monotypy.
Tetralophiellus Ashmead, 1900: 357. Type-species: *Tetralophiellus brivicollis* Ashmead, by monotypy.
Paracalocerinus Girault, 1915*d*: 142. Type-species: *Paracalocerinus australiensis* Girault, by monotypy.
Masia Mercet, 1919*b*: 470. Type-species: *Masia bifasciatella* Mercet, by monotypy.
Anusiella Mercet, 1923*b*: 286. Type-species: *Anusia heydeni* Mayr, by monotypy.
Placoceras Erdös, 1946: 1. Type-species: *Placoceras colocense* Erdös, by monotypy.
Comperencyrtus De Santis, 1964: 106. Type-species: *Comperencyrtus maculipennis* De Santis, by monotypy.

Included species. Twenty, one of which is found in the Neotropics: *maculipennis* (De Santis, 1964: 108; 1968: 150).

Distribution. Argentina, Brazil. World: cosmopolitan except apparently Ethiopian region.

Biology. Parasites of Pseudococcidae (Homoptera).

Comments. Placed in the tribe Tetracnemini, subtribe Tetracnemina.

TIMBERLAKIA Mercet
(Key couplets: ♀ 14; ♂ 23)

Timberlakia Mercet, 1925: 9. Type-species: *Acerophagus europaeus* Mercet, by monotypy.

INCLUDED SPECIES. Two, one of which is found in the Neotropics: *europaea* (Mercet, 1921: 191).

DISTRIBUTION. Mexico, Trinidad. World: cosmopolitan.

BIOLOGY. Parasites of Pseudococcidae (Homoptera).

COMMENTS. Placed in the tribe Aphycini, subtribe Aphycina.

TINEOPHOCTONUS Ashmead

(Key couplet: ♀ 107)

Tineophoctonus Ashmead, 1900: 351. Type-species: *Phaenodiscus armatus* Ashmead, by original designation.

INCLUDED SPECIES. Two, one of which is found in the Neotropics: *armatus* (Ashmead; De Santis, 1964: 364).

DISTRIBUTION. Argentina. World: Nearctic region, Europe.

BIOLOGY. Parasites of gall-inhabiting Tineidae (Lepidoptera), Cynipidae (Hymenoptera) and larvae of Anobiidae and Cerambycidae (Coleoptera).

COMMENTS. Placed in the tribe Cheiloneurini.

TRICHOMASTHUS Thomson

(Key couplets: ♀ 206; ♂ 84, 119)

Trichomasthus Thomson, 1876: 142. Type-species: *Encyrtus cyaneus* Dalman, by designation of Gahan & Fagan, 1923: 148.

Coccidoxenus Crawford, 1913*a*: 248. Type-species: *Coccidoxenus portoricensis* Crawford, by monotypy.

Tetracnemella Girault, 1915*d*: 170. Type-species: *Tetracnemella australiensis* Girault, by original designation.

Stenoteropsis Girault, 1915*d*: 176. Type-species: *Stenoteropsis abjectus* Girault, by monotypy.

INCLUDED SPECIES. Fifty, four of which are found in the Neotropics: *tucumanus* (De Santis, 1964: 251) (**comb. n.** from *Coccidoxenus*), *mexicanus* (Girault, 1917*b*: 21) (**comb. n.** from *Coccidoxenus*), *brasiliensis* (Gomes, 1941: 402; 1942: 36) (**comb. n.** from *Coccidoxenus*) and *portoricensis* (Crawford, 1913*a*: 248); also two further undetermined species from Brazil and Trinidad (BMNH).

DISTRIBUTION. Brazil, Mexico, West Indies. World: cosmopolitan.

BIOLOGY. Parasites of Diaspididae, Coccidae, Pseudococcidae and Eriococcidae (Homoptera).

COMMENTS. The undetermined species from Trinidad is unusual in that the marginal vein of the female is very long (about nine times as long as broad) and it has been reared from *Phenococcus grenadensis* Green & Laing (Homoptera: Pseudococcidae). The clava of the male of this species has the appearance of being two-segmented in dry-mounted material, but in slide-mounted material it is clearly only one-segmented.

Placed in the tribe Microteryini, subtribe Microteryina.

TYNDARICHOIDES Girault

(Key couplets: ♀ 98, 136)

Tyndarichoides Girault, 1920: 189. Type-species: *Tyndarichoides mexicanus* Girault, by monotypy.

INCLUDED SPECIES. One: *mexicanus* Girault, 1920: 189.

DISTRIBUTION. Mexico.

BIOLOGY. Unknown.

COMMENTS. Very close to *Metaphycus* (tribe Aphycini, subtribe Paraphycina) and can only be reliably separated on the characters given in the key. The two genera should very probably be considered synonymous.

ZAOMMA Ashmead
(Key couplets: ♀ 71, 160, 228, ♂ 146)

Zaomma Ashmead, 1900: 401. Type-species: *Encyrtus argentipes* Howard, by monotypy.
Apterencyrtus Ashmead, 1905: 5. Type-species: *Apterencyrtus pulchricornis* Ashmead, by monotypy.
Metallonoidea Girault, 1915*c*: 170. Type-species: *Metallonoidea brittanica* Girault, by monotypy.
Chiloneurinus Mercet, 1921: 646. Type-species: *Chiloneurus microphagus* Mayr, by monotypy.
Richardsius Alam, 1957: 439. Type-species: *Apterencyrtus thomsoniscae* Alam, by original designation.
Metapterencyrtus Tachikawa, 1963: 213. Type-species: *Metapterencyrtus eriococci* Tachikawa, by monotypy.

INCLUDED SPECIES. Fourteen, three of which are found in the Neotropics: *argentipes* (Howard; Noyes, 1979: 166), *epytus* (Walker, 1839: 69) (**comb. n.** from *Encyrtus*) and *lambinus* (Walker) (=*microphagus* Mayr); De Santis, 1964: 361); also six or seven further undetermined species from Brazil, Argentina and Trinidad (BMNH; CNC, Ottawa).

REFERENCE. Key to species: Gordh & Trjapitzin (1979).

DISTRIBUTION. Peru, Argentina, Brazil, Trinidad and St Vincent. World: Nearctic, Ethiopian and Palaearctic regions.

BIOLOGY. Hyperparasites of other chalcids, mainly Encyrtidae, parasitizing Diaspididae (Homoptera).

COMMENTS. The single female of *Encyrtus epytus* in the collections of the BMNH (labelled '*Encyrtus Epytus* Walker, 1302*a* Bahia') is here designated LECTOTYPE. It differs from the other South American species in having all the funicle segments subequal in size and subquadrate.

Placed in the tribe Cheiloneurini.

ZAPLATYCERUS Timberlake
(Key couplets: ♀ 46; ♂ 36. Fig. 27)

Zaplatycerus Timberlake, 1925: 173. Type-species: *Zaplatycerus fullawayi* Timberlake, by monotypy.

INCLUDED SPECIES. Two: *fullawayi* Timberlake and *planiscutellum* Kerrich.

REFERENCE. Revision: Kerrich (1978: 152–155).

DISTRIBUTION. Colombia, Panama, Trinidad.

BIOLOGY. Parasites in Pseudococcidae (Homoptera).

COMMENTS. Placed in the tribe Chrysoplatycerini, subtribe Chrysoplatycerina.

ZARHOPALUS Ashmead
(Key couplets: ♀ 51; ♂ 39. Fig. 28)

Zarhopalus Ashmead, 1900: 406. Type-species: *Zarhopalus sheldoni* Ashmead, by original designation.
Anagyrella Girault, 1915*c*: 168. Type-species: *Anagyrella corvina* Girault, by monotypy.

INCLUDED SPECIES. Five, three of which are found in the Neotropics: *clavatus* Kerrich, *inquisitor* (Howard) and *putophilus* Bennett; also three undetermined species from Brazil, Belize and Trinidad (BMNH; CNC, Ottawa).

REFERENCE. Revision: Kerrich (1978: 126–131).

DISTRIBUTION. Brazil, Trinidad, Belize and Mexico. World: Nearctic region.

Biology. Parasites of Pseudococcidae (Homoptera).

Comments. Placed in the tribe Neodiscodini (Encyrtinae) by Trjapitzin (1973*b*) but transferred later to the Tetracneminae by Trjapitzin & Gordh (1978*b*).

ZETETICONTUS Silvestri

(Key couplets: ♀ 84, 182, 225; ♂ 41, 72, 107)

Aratus Howard, 1897: 155. Type-species: *Aratus scutellatus* Howard, by monotypy. [Homonym of *Aratus* Milne-Edwards, 1853.]
Zeteticontus Silvestri, 1915*b*: 343. Type-species: *Zeteticontus abilis* Silvestri, by monotypy.
Mirrencyrtus Girault, 1915*d*: 115. Type-species: *Mirrencyrtus glabriscutellum* Girault, by monotypy.
Aratiscus Ghesquière, 1946: 368. [Replacement name for *Aratus* Howard.]

Included species. Thirteen, three of which are found in the Neotropics: *insularis* (Howard), *laevigatus* (De Santis, 1972*b*: 55) and *scutellatus* (Howard), also three or four undescribed species from Brazil, Ecuador and Trinidad (BMNH; CNC, Ottawa).

References. Revision: Subba Rao (1972); key to South American species: Noyes (1979: 167–168).

Distribution. Throughout the Neotropics. World: cosmopolitan.

Biology. Parasites of larvae of Nitidulidae and Silvanidae (Coleoptera).

Comments. Placed in the tribe Bothriothoracini, subtribe Coenocercina.

Host index

ARACHNIDA

ACARINA
Ixodidae
Hunterellus

INSECTA

NEUROPTERA
Chrysopidae
Isodromus, *Moorella*
Hemerobiidae
Isodromus
ORTHOPTERA
Meromyzobia
BLATTODEA
Comperia
HETEROPTERA
Ooencyrtus
Pentatomidae
Hexacladia, *Ooencyrtus*
Scutelleridae
Hexacladia

HOMOPTERA
AUCHENORRHYNCHA
Cheiloneurus (via Dryinidae), *Helegonatopus* (via Dryinidae)
Cercopidae
Carabunia
Delphacidae
Echthrodryinus (via other hymenopterous parasites)
Membracidae
Prionomastix
STERNORRHYNCHA
Aphididae
Aphidencyrtus
Psyllidae
Aphidencyrtus, *Prionomitus*, *Psyllaephagus*
COCCOIDEA
Aclerdidae
?*Bennettisca*, *Cheiloneurus* (via other Encyrtidae), *Desantisella* (via Chamaemyiidae), *Microterys*, *Mucrencyrtus*, ?*Paramucrona*
Asterolecaniidae
Habrolepis
Coccidae
Ammonoencyrtus, *Anicetus*, *Cheiloneurus* (via other Encyrtidae and Aphelinidae), *Coccidaphycus*, *Coccidoctonus* (via other Encyrtidae and Pteromalidae), *Diversinervus*, *Gahaniella* (via other Encyrtidae), *Metaphycus*, *Microterys*, *Prochiloneurus* (via other Encyrtidae), *Trichomasthus*
Dactylopiidae
Anagyrus

Diaspididae
Adelencyrtus, *Ameromyzobia*, *Anabrolepis*, *Aphycomorpha*, *Arrhenophagoidea*, *Arrhenophagus*, *Cheiloneurus* (via other Encyrtidae and Aphelinidae), *Coccidencyrtus*, *Comperiella*, *Habrolepis*, ?*Homalopoda*, *Metaphycus*, *Neococcidencyrtus*, *Plagiomerus*, *Pseudhomalopoda*, *Trichomasthus*, *Zaomma* (via other Encyrtidae)
Eriococcidae
Acerophagoides, *Andinoencyrtus*, *Aphycomorpha*, *Atelaphycus*, *Metaphycus*, *Microterys*, *Trichomasthus*
Kermesidae
Microterys
Kerriidae
Metaphycus, *Microterys*, *Parechthrodryinus*, *Tachardiobius*
Lecanodiaspididae
Genus A, *Microterys*
Margarodidae
Aztecencyrtus, *Brethesiella*, *Cheiloneurus* (via other Encyrtidae), *Homosemion*
Ortheziidae
Cheiloneurus (via Drosophilidae)
Pseudococcidae
Acerophagus, *Acroaspidia*, *Aenasius*, *Aeptencyrtus*, *Anagyrus*, *Anarhopus*, *Anathrix*, ?*Anusioptera*, *Apoanagyrus*, *Blepyrus*, *Bothriocraera*, *Chalcaspis*, *Cheiloneurus* (via Encyrtidae), *Chrysoplatycerus*, *Cirrhencyrtus*, *Coccidoctonus* (via Encyrtidae and Pteromalidae), *Coelaspidia*, *Ericydnus*, *Euryrhopalus*, *Gahaniella* (via Encyrtidae), *Gyranusoidea*, *Hambletonia*, *Leptomastix*, *Leptomastidea*, *Microterys*, *Neodusmetia*, *Parechthrodryinus*, *Pauridia*, ?*Pelmatencyrtus*, ?*Pheidoloxenus*, *Prochiloneurus* (via other Encyrtidae), *Pseudaphycus*, *Rhopus*, *Stemmatosteres*, *Tetracnemoidea*, *Tetracnemus*, *Timberlakia*, *Zaplatycerus*, *Zarhopalus*

LEPIDOPTERA
Eggs: *Ooencyrtus*
Larvae: *Copidosoma*, *Echthrodryinus* (via other parasitic Hymenoptera), *Epiencyrtus*, *Litomastix*, ?*Neapsilophrys*, *Tanyencyrtus*
Gelechiidae
Apsilophrys, *Paralitomastix*
Gracillariidae
Paraleurocerus
Lyonetiidae
Echthrodryinus (via other parasitic Hymenoptera), *Parablastothrix*
Nepticulidae
Parablastothrix
Pterophoridae
Ageniaspis
Pyralidae
Paralitomastix, *Pentalitomastix*
Tineidae
Ageniaspis, *Tineophoctonus*
Tortricidae
Pentalitomastix
Yponomeutidae
Ageniaspis, *Copidosoma*

COLEOPTERA
Anobiidae
Tineophoctonus
Buprestidae
Avetianella, *Szelenyiola*
Cerambycidae
Avetianella, *Tineophoctonus*
Coccinellidae
Anagyrus, *Coccidoctonus*, *Homalotylus*, *Prochiloneurus* (via other Encyrtidae)
Nitidulidae
Zeteticontus
Silvanidae
Zeteticontus
Scolytidae
Avetianella, *Szelenyiola*

DIPTERA
Cecidomyiidae
Coccidoctonus
Ceratopogonidae
Forcipestricis
Chamaemyiidae
Cerchysius, *Cheiloneurus*, *Desantisella*
Drosophilidae
Cheiloneurus
Syrphidae
Bothriothorax, *Exoristobia*, *Syrphophagus*
Tachinidae
Exoristobia

HYMENOPTERA
Echthrodryinus
Aphelinidae
Cheiloneurus, *Aphidencyrtus*
Aphidiidae
Aphidencyrtus
Braconidae
Echthrodryinus
Cynipidae
?*Tineophoctonus*
Dryinidae
Cheiloneurus, *Echthrodryinus*, *Helegonatopus*
Encyrtidae
Cheiloneurus, *Coccidoctonus*, *Epiencyrtus*, *Gahaniella*, *Prochiloneurus*, *Zaomma*
Formicidae (?)
Pheidoloxenus

Pteromalidae
Coccidoctonus

Xylocopidae
Coelopencyrtus

Proposed new synonymies

(Junior synonyms on right)

Generic

Anagyrus Howard = *Gyranusia* Brèthes **syn. n.**, = *Paranusia* Brèthes **syn. n.**, = *Philoponectroma* Brèthes **syn. n.**
Anathrix Burks = *Aglyptoideus* De Santis **syn. n.**
Apsilophrys De Santis = *Copidencyrtus* De Santis **syn. n.**
Brethesiella Porter = *Neocopidosoma* Blanchard **syn. n.**, = *Noblanchardia* Ghesquière **syn. n.**
Cheiloneurus Westwood = *Metacheiloneurus* Hoffer **syn. n.**
Chrysoplatycerus Ashmead = *Metaplatycerus* Gordh & Trjapitzin **syn. n.**
Coccidoctonus Crawford = *Quaylea* Timberlake **syn. n.**
Ericydnus Walker = *Grandoriella* Domenichini **syn. n.**
Leptomastidea Mercet = *Leptanusia* De Santis **syn. n.**
Metaphycus Mercet = *Notoencyrtus* De Santis **syn. n.**
Moorella Cameron = *Chrysopophilus* Timberlake **syn. n.**
Plagiomerus Crawford = *Parahomalopoda* Girault **syn. n.**
Syrphophagus Ashmead = *Syrphidencyrtus* Blanchard **syn. n.**

Specific

Prochiloneurus dactylopii (Howard) = *Achrysopophagus argentinensis* De Santis **syn. n.**

Proposed new combinations

(Original genus in brackets)

Anagyrus bifasciatus (Brèthes) **comb. n.** (*Paranusia*)
Anagyrus porteri (Brèthes) **comb. n.** (*Gyranusia*)
Anathrix rustica (De Santis) **comb. n.** (*Aglyptoideus*)
Apoanagyrus malenotus (De Santis) **comb. n.** (*Leptomastix*)
Apoanagyrus montivagus (De Santis) **comb. n.** (*Leptomastix*)
Apsilophrys capsicum (Burks) **comb. n.** (*Copidosoma*)
Apsilophrys gracilis (De Santis) **comb. n.** (*Copidencyrtus*)
Aztecencyrtus iceryae (Howard) **comb. n.** (*Cerchysius*)
Brethesiella coccidophaga (Blanchard) **comb. n.** (*Neocopidosoma*)
Cheiloneurus gahani (Dozier) **comb. n.** (*Achrysopophagus*)
Cirrhencyrtus diversicolor (Compere) **comb. n.** (*Aphycus*)
Coccidoctonus whittieri (Girault) **comb. n.** (*Cerchysius*)
Copidosoma silvestrii (Costa Lima) **comb. n.** (*Paralitomastix*)
Desobius sylvicola (De Santis) **comb. n.** (*Tyndarichus*)
Ericydnus lamasi (Domenichini) **comb. n.** (*Grandoriella*)
Hemencyrtus brasiliensis (Ashmead) **comb. n.** (*Bothriothorax*)
Leptomastidea bahiensis (Compere) **comb. n.** (*Leptomastix*)
Leptomastidea dispar (Kerrich) **comb. n.** (*Leptomastix*)
Litomastix calypso (Crawford) **comb. n.** (*Holcencyrtus*)
Lohiella flaviclava (Howard) **comb. n.** (*Encyrtus*)
Mercetencyrtus gracilicornis (De Santis) **comb. n.** (*Syrphophagus*)
Metaphycus ceroplastae (Dozier) **comb. n.** (*Coccidoctonus*)
Metaphycus discolor (De Santis) **comb. n.** (*Aphycus*)
Metaphycus guttofasciatus (De Santis) **comb. n.** (*Notoencyrtus*)
Metaphycus maculipes (Howard) **comb. n.** (*Aphycus*)
Metaphycus niger (Brèthes) **comb. n.** (*Aphycus*)
Metaphycus oaxacae (Howard) **comb. n.** (*Aphycus*)
Metaphycus ogloblini (De Santis) **comb. n.** (*Dicarnosis*)
Metaphycus portoricensis (Dozier) **comb. n.** (*Euaphycus*)
Metaphycus rusti (Timberlake) **comb. n.** (*Aphycus*)
Moorella compressiventris (Timberlake) **comb. n.** (*Chrysopophilus*)
Mucrencyrtus aclerdae (De Santis) **comb. n.** (*Aenasioidea*)
Parablastothrix chilensis (Brèthes) **comb. n.** (*Archinus*)
Paraleurocerus reticulatus (De Santis) **comb. n.** (*Ageniaspis*)
Parechthrodryinus nitidus (Howard) **comb. n.** (*Encyrtus*)
Plagiomerus peruviensis (Girault) **comb. n.** (*Parahomalopoda*)

Rhytidothorax bollowi (Mercet) **comb. n.** (*Parencyrtus*)
Rhytidothorax flaviclava (De Santis) **comb. n.** (*Parastenoterys*)
Rhytidothorax flavicornis (De Santis) **comb. n.** (*Parastenoterys*)
Rhytidothorax hirtus (Howard) **comb. n.** (*Encyrtus*)
Rhytidothorax perhispidus (De Santis) **comb. n.** (*Parastenoterys*)
Syrphophagus bacchae (Blanchard) **comb. n.** (*Syrphidencyrtus*)
Syrphophagus flavitibiae (De Santis) **comb. n.** (*Syrphidencyrtus*)
Syrphophagus nigricornis (De Santis) **comb. n.** (*Syrphidencyrtus*)
Tetracnemoidea peregrina (Compere) **comb. n.** (*Tetracnemus*)
Tetracnemoidea brevicornis (Girault) **comb. n.** (*Arhopoideus*)
Trichomasthus brasiliensis (Gomes) **comb. n.** (*Coccidoxenus*)
Trichomasthus mexicanus (Girault) **comb. n.** (*Coccidoxenus*)
Trichomasthus tucumanus (De Santis) **comb. n.** (*Coccidoxenus*)
Zaomma epytus (Walker) **comb. n.** (*Encyrtus*)

Lectotype designations

(Present genus in brackets)

Aseirba caudata Cameron (*Aseirba*)
Cheiloneurus dactylopii (Howard) (*Prochiloneurus*)
Encyrtus epytus Walker (*Zaomma*)
Hemencyrtus herbertii Ashmead (*Hemencyrtus*)
Ooencyrtus chrysopae Crawford (*Ooencyrtus*)
Ooencyrtus trinidadensis Crawford (*Ooencyrtus*)

Acknowledgements

I wish to thank Dr M. Favreau (AMNH, New York), Dr G. Prinsloo (PPRI, Pretoria), Dr G. Gordh (UC, Riverside), Mr P. Fidalgo (Tucuman, Argentina), and particularly Dr L. Masner and Dr C. Yoshimoto (CNC, Ottawa) for their generous loans or gifts of material. My special thanks to Professor L. De Santis (MLP, Argentina) and Dr E. E. Grissell (USNM, Washington) for arranging loans of important type- and other material. Also to Dr F. D. Bennett (CIBC, Trinidad) for all his help and generosity, to Dr Z. Bouček for his comments and to my colleagues at the BMNH for their comments on the keys. Finally I am indebted to Miss V. Dick who typed the final manuscript.

References

Agarwal, M. M. 1965. Taxonomy of encyrtid parasites (Hymenoptera: Chalcidoidea) of Indian Coccoidea. *Acta hymenopt., Tokyo* **2**: 37–97.

—— 1966. Three undescribed genera and species of Encyrtidae (Hymenoptera: Chalcidoidea) parasitic on coccids. *Proc. Indian Acad. Sci.* (B) **63**: 67–79.

Alam, S. M. 1957. Taxonomy of some encyrtid parasites (Hymenoptera, Chalcidoidea) of British scale insects. *Trans. R. ent. Soc. Lond.* **109**: 421–466.

Alayo, D. P. & Hernández, L. R. 1978. *Introducción al estudio de los Himenópteros de Cuba*. Superfamilia Chalcidoidea. 105 pp. Habana.

Annecke, D. P. 1962. New reared species of *Prionomastix* Mayr with synonymical notes (Hymenoptera, Encyrtidae). *S. Afr. J. agr. Sci.* **5**: 503–513.

—— 1967. The genera *Anicetus* Howard, 1896, *Paracerapterocerus* Girault, 1920, and allies, with descriptions of new genera and species (Hymenoptera: Encyrtidae). *Trans. R. ent. Soc. Lond.* **119**: 99–169.

—— 1968. Records and descriptions of African Encyrtidae. 4. (Hymenoptera: Chalcidoidea). *J. ent. Soc. sth. Afr.* **31**: 249–269.

Annecke, D. P. & Mynhardt, M. J. 1970. On some species of *Habrolepis* Foerster and *Adelencyrtus* Ashmead (Hym., Encyrtidae) in southern Africa and Mauritius. *Entomophaga* **15**: 127–148.

—— —— 1971. The species of the *zebratus*-group of *Metaphycus* Mercet (Hym., Encyrtidae) from South Africa, with notes on some extra-limital species. *Revue Zool. Bot. afr.* **83**: 322–360.

—— —— 1972. The species of the *insidiosus*-group of *Metaphycus* Mercet in South Africa with notes on some extra-limital species (Hymenoptera: Encyrtidae). *Revue Zool. Bot. afr.* **85**: 227–274.

—— —— 1974. On the identity of *Copidosoma koehleri* Blanchard, 1940 (Hymenoptera: Encyrtidae). *J. ent. Soc. sth. Afr.* **37**: 31–33.

Annecke, D. P. & Prinsloo, G. L. 1974. On some new and described species of arrhenophagine Encyrtidae (Hymenoptera). *J. ent. Soc. sth. Afr.* **37**: 35–47.

Ashmead, W. H. 1881. On two new chalcid flies from Florida, parasitic upon the larvae of syrphus flies. *Can. Ent.* **13**: 170–172.

—— 1889. A final word about the genus *Rileya*. *Can. Ent.* **21**: 37–38.

—— 1891. An encyrtid with six-branched antennae. *Insect Life* **3**: 455–457.

—— 1894. Notes on cotton insects found in Mississippi. *Insect Life* **7**: 240–247.

—— 1900. On the genera of chalcid-flies belonging to the subfamily Encyrtinae. *Proc. U.S. natn. Mus.* **22**: 323–412.

—— 1902. The hymenopterous parasites of *Phenacoccus cavalliae* Ckll. *Can. Ent.* **34**: 301–302.

—— 1904*a*. Classification of the chalcid flies of the superfamily Chalcidoidea, with descriptions of new species in the Carnegie Museum, collected in South America by Herbert H. Smith. *Mem. Carneg. Mus.* **1** (4): i–ix, 225–551, 39 pls.

—— 1904*b*. A list of the Hymenoptera of the Philippine Islands, with descriptions of new species. *Jl N.Y. ent. Soc.* **12**: 1–22.

—— 1905. New Hymenoptera from the Philippine Islands. *Can. Ent.* **37**: 3–8.

Aurivillius, C. 1888. *Arrhenophagus*, ett nytt slägte bland Encyrtiderna. *Ent. Tidskr.* **9**: 144–147, 1 pl.

Bakkendorf, O. 1965. Perilampidae, Eupelmidae, Encyrtidae (Hym., Chalcidoidea) from the Hansted Reservation with descriptions of new species. *Ent. Meddr* **30** (2): 105–187.

Blanchard, E. E. 1936. Apuntes sobre Calcidoideos argentinos, nuevos y conocidos. *Revta Soc. ent. argent.* **8**: 7–32.

—— 1940. Apuntes sobre Encirtidos argentinos. *An. Soc. cient. Argent.* **130**: 106–128.

Brèthes, J. 1913. Himenópteros de la América meridional. *An. Mus. nac. Hist. nat. B. Aires* **24**: 35–160.

—— 1916*a*. Description de trois Chalcididae du Chili. *Revta chil. Hist. nat.* **20**: 8–10.

—— 1916*b*. Hyménoptères parasites de l'Amérique méridionale. *An. Mus. nac. Hist. nat. B. Aires* **27**: 401–430.

—— 1919. Cueillette d'insectes du Rio Blanco. *Revta chil. Hist. nat.* **22**: 161–171.

—— 1920. Description d'un Encyrtide nouveau du Chili. *Revta chil. Hist. nat.* **24**: 137–139.

—— 1921*a*. Nouveaux Hyménoptères parasites du Chili. *An. Zool. apl.* **8**: 6–8.

—— 1921*b*. Description d'un *Ceroplastes* de la république Argentine et de son parasite. *Bull. Soc. ent. Fr.* **1921**: 79–80.

Brues, C. T. 1910. Some parasitic Hymenoptera from Vera Cruz, Mexico. *Bull. Am. Mus. nat. Hist.* **28**: 79–85.

Burks, B. D. 1952. A new mealy bug parasite (Hymenoptera: Encyrtidae). *Jl N.Y. ent. Soc.* **40**: 179–182.

—— 1958. A recharacterization of the genus *Coelopencyrtus*, with descriptions of two new species (Hymenoptera: Encyrtidae). *J. Wash. Acad. Sci.* **48**: 22–26.

—— 1967. A new polyembryonic parasite of the pepper moth (Hymenoptera: Encyrtidae). *Proc. ent. Soc. Wash.* **69**: 53–55.

—— 1968. A new chalcidoid parasite of a ceratopogonid midge (Hymenoptera, Encyrtidae). *Ent. News* **79**: 236–240.

—— 1972. The genus *Hexacladia* Ashmead (Hymenoptera: Encyrtidae). *Proc. ent. Soc. Wash.* **74** (4): 363–371.

Caltagirone, L. E. 1966. A new *Pentalitomastix* from Mexico (Hymenoptera: Encyrtidae). *Pan-Pacif. Ent.* **42** (2): 145–151.

Cameron, P. 1884. Insecta. Hymenoptera (part). *Biologia cent.-am.* **32**: 121–128.

—— 1913. The Hymenoptera of the Georgetown Museum, part V. *J. R. Agric. Soc., Demerara* **3**: 105–137.

Clausen, C. P. 1915. Mealy bugs of citrus trees. *Bull. Calif. Univ. agric. Coll., Berkeley* no. 258: 19–48.

Compere, H. 1926. Descriptions of new coccid inhabiting chalcidoid parasites (Hymenoptera). *Univ. Calif. Publs Ent.* **4**: 1–31.

—— 1928. New coccid-inhabiting chalcidoid parasites from Africa and California. *Univ. Calif. Publs Ent.* **4**: 208–230.

—— 1936. A new genus and species of Encyrtidae parasitic in the pineapple mealybug, *Pseudococcus brevipes* (Ckll.). *Proc. Hawaii. ent. Soc.* **9**: 171–174.

—— 1938. A report on some miscellaneous African Encyrtidae in the British Museum. *Bull. ent. Res.* **29**: 315–337.

—— 1939. Mealybugs and their insect enemies in South America. *Univ. Calif. Publs Ent.* **7**: 57–74.

—— 1940. The African species of *Metaphycus* Mercet. *Bull. ent. Res.* **31**: 7–33.

—— 1947. A report on a collection of Encyrtidae with description of new genera and species. *Univ. Calif. Publs Ent.* **8**: (1): 1–24.

—— 1957. Descriptions of species of *Metaphycus* recently introduced into California and some corrections. *Boll. Lab. Ent. agr. Filippo Silvestri* **15**: 221–230.

Compere, H. & Annecke, D. P. 1960. A reappraisal of *Aphycus* Mayr, *Metaphycus* Mercet and related genera (Encyrtidae). *J. ent. Soc. sth. Afr.* **23**: 375–389.

—— —— 1961. Descriptions of parasitic Hymenoptera and comments (Hymenopt.: Aphelinidae, Encyrtidae, Eulophidae). *J. ent. Soc. sth. Afr.* **24**: 17–71.

Compere, H. & Zinna, G. 1955. Tre nuovi generi e cinque nuove especie di Encyrtidae. *Boll. Lab. Ent. agr. Filippo Silvestri* **14**: 94–116.

Costa Lima, A. da 1956. Sobre dois microimenopteros provelmente poliembrionicos (Chalcidoidea, Encyrtidae, Encyrtinae). *Boll. Lab. Zool. gen. agr. Portici* **33**: 29–34.

Costa Lima, A. da & Ferreira, O. 1963. Sôbre um Microhimenóptero calcidóide provâvelmente poliembriônico, endoparasito da larva de "*Xylocopa* sp." (Encyrtidae, Encyrtinae). *Revta bras. Biol.* **23**: 429–434.

Crawford, J. C. 1910. Three new genera and species of parasitic Hymenoptera. *Proc. U.S. natn. Mus.* **38**: 87–90.

—— 1911. Descriptions of new Hymenoptera. No. 3. *Proc. U.S. natn. Mus.* **41**: 267–282.

—— 1912. Descriptions of new Hymenoptera, No. 5. *Proc. U.S. natn. Mus.* **43**: 163–188.

—— 1913*a*. Descriptions of new Hymenoptera, No. 6. *Proc. U.S. natn. Mus.* **45**: 241–260.

—— 1913*b*. Descriptions of new Hymenoptera, No. 8. *Proc. U.S. natn. Mus.* **46**: 343–352.

—— 1914. New parasitic Hymenoptera from British Guiana. *Proc. ent. Soc. Wash.* **16**: 85–88.

Dahlbom, A. G. 1857. Svenska Små-Ichneumonernas Familjer och slügten. *Öfvers K. VetenskAkad. Förh.* **14**: 289–298.

Dalla Torre, K. W. von 1897. Zur Nomenclatur der Chalcididen-Genera. *Wien. ent. Ztg* **16**: 83–88.

—— 1898. *Catalogus Hymenopterorum hucusque descriptorum systematicus et synonymicus*. V. Chalcididae et Proctotrupidae. 598 pp. Leipzig.

Dalman, J. W. 1820. Försök till Uppställning af Insect-familjen Pteromalini, i synnerhet med afscen de på de i Sverige funne Arter. *K. svenska VetenskAkad. Handl.* **41**: 123–174, 177–182.

De Santis, L. 1939. Sobre dos nuevos Encirtidos hallados en la república Argentina con descripción de un nuevo género (Hymenoptera, Chalcidoidea). *Notas Mus. La Plata* (Zool.) **4**: 327–338.

—— 1950. Lista de sinonimías establecidas para los géneros y sub-géneros de Chalcidoidea (Hymenoptera). *Revta Mus. La Plata* (N.S.) **6**: 47–67.

—— 1955. Los insectos de las Islas Juan Fernandez. 27 Chalcidoidea I (Hymenoptera). *Revta chil. Ent.* **4**: 167–198.

—— 1956. Nota sobre himenópteros parásitos de dos cochinillas patagónicas. *Boll. Lab. Zool. gen. agr. Portici* **33**: 187–197.

—— 1960. Descripción de un nuevo género y de una nueva especie de encirtido del Brasil (Hymenoptera: Chalcidoidea). *Acta Trab. y Congr. sudamer. Zool.* **1959** (3): 61–65.

—— 1964. Encirtidos de la Republica Argentina (Hymenoptera: Chalcidoidea). *An. Comn Invest. cient. Prov. B. Aires* **4**: 9–422.

—— 1965. Una nueva especie de *Echthroplexiella* de la Republica Argentina (Hymenoptera: Encyrtidae). *Notas Comun Invest. cient.* **2** (9): 3–6.

—— 1967*a*. Adiciones a la fauna Argentina de Encirtidos: I (Hymenoptera: Chalcidoidea). *Acta zool. lilloana* **23**: 67–75.

—— 1967*b*. *Catálogo de los Himenópteros argentinos de la serie Parasitica, incluyendo Bethyloidea*. 337 pp. La Plata.

—— 1968. Adiciones a la fauna argentina de Encírtidos. II (Hymenoptera). *Rev. Mus. La Plata* (Zool.) **10** (82): 149–154.

—— 1970. Una nueva especie de encírtido del Brasil (Hymenoptera—Encyrtidae). *Bol. Univ. Fed. Parana* (Zool.) **4** (3): 3–15.

—— 1972*a*. Complejo entomofágico de *Aclerda campinensis* (Hom.) en el estado de alagoas (Brasil). *An. Soc. ent. Bras.* **1**: 17–24.

—— 1972*b*. Adiciones a la fauna argentina de encírtidos. III. (Hymenoptera: Chalcidoidea). *Revta peru. Ent. agric.* **15**: 44–60, 24 figs.

—— 1979. *Catálogo de los Himenópteros Calcidoideos de América al sur de los Estados Unidos*. 488 pp. La Plata.

De Santis, L., Sarmiento, J. A. V., Rabinovich, J. E. & Piñero, D. F. de 1976. Himenópteros parasitoides de *Rhodnius prolixus* (Hem.) en Venezuela. *Revta Soc. ent. argent.* **35**: 135–142.

Destefani, T. 1889. Miscellanea imenotterologica Sicula. *Naturalista sicil.* **8**: 140–145.

Domenichini, G. 1951. Parassiti e iperparassiti di *Pseudococcus citri* Risso in Italia e nel Peru. *Boll. Zool. agr. Bachic.* **17**: 157–180.

Doutt, R. L. 1948. *Arrenoclavus*, a new genus of polyembryonic Encyrtidae (Hymenoptera). *Pan-Pacif. Ent.* **24**: 145–148.

Dozier, H. L. 1926. Some new Porto Rican scale parasites (Hymenoptera: Encyrtidae). *Proc. ent. Soc. Wash.* **28**: 97–102.

—— 1927. Notes on Porto Rican scale parasites. *J. Dep. Agric. P. Rico* **10**: 267–277.

—— 1932. An important new encyrtid parasite of the mealy-bug *Pseudococcus virgatus* (Ckll.). *Proc. ent. Soc. Wash.* **34**: 7–9.

—— 1936. Descriptions of two new encyrtid parasites of non-diaspine scales. *Proc. ent. Soc. Wash.* **37**: 183–185.

—— 1937. Description of miscellaneous chalcidoid parasites of Porto Rico. *J. Agric. Univ. P. Rico* **21**: 121–135.

Eady, R. D. 1960*a*. A new genus and two new species of Encyrtidae (Hymenoptera, Chalcidoidea) from the banana scab moth, *Nacoleia octasema* (Meyr.). *Bull. ent. Res.* **50**: 667–670.

—— 1960*b*. *Pentalitomastix*, a new name for *Pseudolitomastix* Eady (Hymenoptera, Chalcidoidea). *Bull. ent. Res.* **51**: 173.

Embleton, A. L. 1902. On the economic importance of the parasites of Coccidae. *Trans. ent. Soc. Lond.* **35**: 219–229.

Erdös, J. 1946*a*. Description of a new genus and species of the family Encyrtidae (Hymenoptera, Chalcid.). *Fragm. faun. hung.* **9**: 1–2.

—— 1946*b*. Genera nova et species novae chalcidoidarum (Hym.). *Annls hist.-nat. Mus. natn. hung.* **39**: 131–165.

—— 1961. Symbola ad cognitionem faunae encyrtidarum et aphelinidarum Hungariae. *Acta zool. hung.* **7**: 413–423.

Ferrière, C. 1956. Encyrtides parasites de cochenilles sur graminées. *Boll. Lab. Zool. gen. agr. Portici* **33**: 350–364.

Förster, A. 1856. *Hymenopterologische Studien.* 2. Chalcidae und Proctotrupii. 152 pp. Aachen.

—— 1860. Eine zweite Centurie neuer Hymenopteren. *Verh. naturh. Ver. preuss. Rheinl.* **17**: 93–153.

Fullaway, D. T. 1913. Report of the entomologist: scale insect parasites. *Rep. Hawaii agric. Exp. Stn.* **1912**: 26–31.

Gahan, A. B. 1927. Miscellaneous descriptions of new parasitic Hymenoptera with some synonymical notes. *Proc. U.S. natn. Mus.* **71**: 1–39, 1 pl.

—— 1943. A new encyrtid parasitic in the eggs of Hesperiidae. *J. Agric. Univ. P. Rico* **27**: 137–139.

Gahan, A. B. & Fagan, M. M. 1923. The type species of the genera of Chalcidoidea or chalcid-flies. *Bull. U.S. natn. Mus.* **124**: 1–173.

Ghesquière, J. 1946. Contribution à l'étude des Microhyménoptères du Congo Belge. X–XI. *Rev. zool. Bot. afr.* **39**: 367–373.

—— 1957. Le genre *Rhopus* Foerster nouveau pour l'Amérique du Sud (Hym. Chalcidoidea, Encyrtidae). *Neotropica* **3** (10): 17–22.

Girault, A. A. 1911. The chalcidoid parasites of the coccid *Kermes pubescens* Bogue, with descriptions of two new genera and three new species of Encyrtidae from Illinois. *Can. Ent.* **43**: 168–178.

—— 1913*a*. More new genera and species of chalcidoid Hymenoptera from Paraguay. *Arch. Naturgesch.* (A) **79** (6): 51–69.

—— 1913*b*. Some chalcidoid Hymenoptera from North Queensland. *Arch. Naturgesch.* (A) **79**: 70–90.

—— 1915*a*. Some new chalcidoid Hymenoptera from North and South America. *Ann. ent. Soc. Am.* **8**: 272–278.

—— 1915*b*. Four new encyrtids from Sicily and the Philippines. *Entomologist* **48**: 184–186.

—— 1915*c*. New genera of chalcidoid Hymenoptera. *Jl N.Y. ent. Soc.* **23**: 165–173.

—— 1915*d*. Australian Hymenoptera Chalcidoidea — VII. The family Encyrtidae with descriptions of new genera and species. *Mem. Qd Mus.* **4**: 1–184.

—— 1916*a*. New miscellaneous chalcidoid Hymenoptera with notes on described species. *Ann. ent. Soc. Am.* **9**: 291–308.

—— 1916*b*. A remarkable new genus of Encyrtidae from the West Indies, bearing two ring-joints. *J. N.Y. ent. Soc.* **24**: 232–233.

—— 1916*c*. New Javanese chalcidoid Hymenoptera. *Proc. U.S. natn. Mus.* **51**: 479–485.

—— 1916*d*. New Encyrtidae from North America. *Psyche, Camb.* **23**: 41–50.

—— 1917*a*. Descriptions of miscellaneous chalcid-flies. *Insecutor Inscit. menstr.* **4**: 109–121.

—— 1917*b*. *Descriptiones stellarum novarum.* 22 pp. (privately published).

—— 1917*c*. *Chalcidoidea nova Marilandensis III*. 6 pp. (privately published).

—— 1920. New serphidoid, cynipoid and chalcidoid Hymenoptera. *Proc. U.S. natn. Mus.* **58**: 177–216.

Gomes, J. G. 1941. Um novo parasito de Coccidae (Chalcidoidea — Encyrtidae). *Bolm Soc. bras. Agron.* **4**: 401–404.

—— 1942. Subsídios à sistemática dos Calcidídeos brasileiros. *Bolm Esc. nac. Agron., Rio de J.* **2**: 9–45.

Gordh, G. 1975. A new species of *Forcipestricis* Burks, 1968 (Hymenoptera: Encyrtidae) from Puerto-Rico parasitic on *Forcipomyia* (Diptera: Ceratopogonidae). *Fla Ent.* **58**: 239–241.

Gordh, G. & Trjapitzin, V. A. 1978. A revision of the genus *Echthrodryinus* Perkins, 1906 (Hymenoptera: Encyrtidae). *J. Kans. ent. Soc.* **51**: 711–720.

—— —— 1979. Notes on the genus *Zaomma* Ashmead, with a key to species (Hymenoptera: Encyrtidae). *Pan-Pacif. Ent.* **55**: 34–40.

Graham, M. W. R. de V. 1958. Notes on some genera and species of Encyrtidae (Hym., Chalcidoidea), with special reference to Dalman's types. *Ent. Tidskr.* **79**: 147–175.

Hall, J. C. 1974. A new genus and species of mealybug parasite from Paraguay (Hymenoptera: Encyrtidae). *Ent. News* **85**: 19–20.

Hayat, M., Alam, S. & Agarwal, M. M. 1975. *On Indian Insect Types*. Taxonomic survey of encyrtid parasites (Hymenoptera: Encyrtidae) in India. **2**, 112 pp. Aligarh.

Hoffer, A. 1954. Encyrtidae našich státních přírodních reservaci II. *Ochrana přírody* **9**: 169–173.

—— 1957. Československé druhy subtribu Cheiloneurii. *Čas. čsl. Spol. ent.* **54**: 327–355.

—— 1960. A revision of the Czechoslovak genera of the subfamily Encyrtinae with a reduced number of funicle segments (Hymenoptera, Chalcidoidea). *Sb. faun. Prací, ent. Odd. nár. Mus. Praze* **6**: 93–120.

—— 1963. Descriptions of new species of the family Encyrtidae from Czechoslovakia (Hym., Chalcidoidea). I. *Sb. faun. Prací ent. Odd. nár. Mus. Praze* **35**: 549–592.

—— 1965. Předběžná zprava o chalcidkách, parasitijících na druzich čeledi Dryinidae (Hym.) na území našeho státu. *Zpr. čsl. Spol. ent.* **1** (3): 12–17.

—— 1970. Zweiter Beitrag zur Taxonomie der palaearktischen Arten der Gattung *Aphidencyrtus* Ashm. (Hym., Chalc., Encyrtidae). *Studia Ent. Forest.* **1**: 65–80.

Howard, L. O. 1882. A new *Icerya* parasite. *Insect Life* **4**: 378–379.

—— 1887. *In* Report of the entomologist. *Rep. U.S. Dep. Agric.* **1886**: 488.

—— 1888. The chalcid genus *Rileya*. *Can. Ent.* **20**: 191–195.

—— 1892. Insects of the subfamily Encyrtidae with branched antennae. *Proc. U.S. natn. Mus.* **15**: 361–369.

—— 1897. On the Chalcididae of the Island of Grenada, B.W.I. *J. Linn. Soc.* (Zool.) **26**: 129–178.

—— 1898*a*. A new parasite of the harlequin cabbage bug. *Can. Ent.* **30**: 17–18.

—— 1898*b*. On some new parasitic insects of the subfamily Encyrtinae. *Proc. U.S. natn. Mus.* **21**: 231–248.

—— 1906. An interesting new genus and species of Encyrtidae. *Ent. News* **17**: 121–122.

—— 1908. Another chalcidoid parasite of a tick. *Can. Ent.* **40**: 239–241.

—— 1910. On some parasites reared or supposed to be reared from the eggs of the gypsy moth. *Tech. Ser. Bur. Ent. U.S.* **19** (1): i–v, 1–12.

Howard, L. O. & Ashmead, W. H. 1896. On some reared parasitic hymenopterous insects from Ceylon. *Proc. U.S. natn. Mus.* **18**: 633–648.

Ishii, T. 1923. Observations on the hymenopterous parasites of *Ceroplastes rubens* Mask., with descriptions of new genera and species of the subfamily Encyrtinae. *Bull. imp. Pl. Quarant. Stn Yokohama* **3**: 69–114.

Jansson, A. 1957. Zwei neue Microhymenopteren aus Schweden, *Batrachencyrtus callidii* nov. gen. nov. sp. (Chalcidoidea, Encyrtidae), *Aphanogmus annulicornis* nov. sp. (Proctotrupoidea, Calliceratidae). *Ent. Tidskr.* **78**: 71–74.

Kerrich, G. J. 1953. Report on Encyrtidae associated with mealy bugs on cacao in Trinidad and on some other species related thereto. *Bull. ent. Res.* **44**: 789–810.

—— 1954. A systematic study of the encyrtid genus *Cerchysius* Westwood (Hym., Chalcidoidea). *Ann. Mag. nat. Hist.* (12) **7**: 371–379.

—— 1964. On the European species of *Dusmetia* Mercet and a new Oriental genus (Hym., Chalcidoidea, Encyrtidae). *Entomophaga* **9**: 75–79.

—— 1967. On the classification of the anagyrine Encyrtidae, with a revision of some of the genera (Hymenoptera: Chalcidoidea). *Bull. Br. Mus. nat. Hist.* (Ent.) **20**: 143–250.

—— 1978. A revision of the dinocarsiine Encyrtidae with a study of the genus *Pelmatencyrtus* De Santis (Hymenoptera: Chalcidoidea). *J. Linn. Soc.* (Zool.) **62**: 109–159.

Kieffer, J. J. & Jörgensen, P. 1910. Gallen und Gallentiere aus Argentinien. *Zentbl. Bakt. ParasitKde* (2) **27**: 362–444.

Latreille, P. A. 1809. *Genera crustaceorum et insectorum* **4**, 399 pp. Parisius et Argentorati.

Mani, M. S. 1935. A new encyrtid chalcid genus *Krishnieriella* gen. nov. from India. *Rec. Indian Mus.* **37**: 421–423.

Mann, W. M. 1914. Some myrmecophilous insects from Mexico. *Psyche, Camb.* **21**: 173–184.

Mayr, G. L. 1876. Die europaïschen Encyrtiden. *Verh. zool.-bot. Ges. Wien* **25**: 675–778.

Mercet, R. G. 1916. Calcídidos de España. *Boln R. Soc. esp. Hist. nat.* **16**: 112–117.

—— 1917*a*. Especies españolas del género *Aphycus*. *Boln R. Soc. esp. Hist. nat.* **17**: 128–139.

—— 1917*b*. Un nuevo género de Encirtinos. *Boln R. Soc. esp. Hist. nat.* **17**: 203–206.

—— 1917*c*. Géneros nuevos de Encirtinos (Himenópteros, Chalcididos). *Boln R. Soc. esp. Hist. nat.* **17**: 537–544.

—— 1918. Géneros nuevos de Encirtinos de España. *Boln R. Soc. esp. Hist. nat.* **18**: 234–241.

—— 1919*a*. Encirtinos de España. *Boln R. Soc. esp. Hist. nat.* **19**: 96–102.

—— 1919*b*. Notas sobre Encirtinos (Himenopteros, Calcididos). *Boln R. Soc. esp. Hist. nat.* **19**: 470–478.

—— 1921. *Fauna Ibérica*. Himenópteros Fam. Encirtidos, 727 pp. Madrid.

—— 1923*a*. Adiciones à la fauna española de Encirtidos. 1ª nota. *Boln R. Soc. esp. Hist. nat.* **22**: 474–481.

—— 1923*b*. Encirtidos de Europa Central, nuevos o poco conocidos (2ª nota). *Boln R. Soc. esp. Hist. nat.* **23**: 286–292.

—— 1924. Los géneros *Leptomastidea, Callipteroma* y *Gyranusa*. *Boln R. Soc. esp. Hist. nat.* **24**: 252–260.

—— 1925. El género *Aphycus* y sus afines. *Eos, Madr.* **1**: 7–31.

—— 1928. Nota sobre algunos Encirtidos americanos (Hym. Chalc.). *Eos, Madr.* **4**: 6–12.

Miller, C. D. F. 1961. A new genus and species of chalcid (Hymenoptera, Encyrtidae). *Can. Ent.* **93**: 494–496.

Myartseva, S. N. 1977*a*. A new species of encyrtid *Anathrix acanthococci* Myartseva, sp. n. (Hymenoptera, Chalcidoidea) — a parasite of the coccid *Acanthococcus* sp. (Homoptera, Coccoidea) on wormwood in southern Turkmenistan. [In Russian.] *Izv. Akad. Nauk turkmen. SSR.* (Biol.) **1977** (4): 41–46.

—— 1977*b*. The genus *Neococcidencyrtus* (Hymenoptera, Encyrtidae) new to the USSR, and a description of a new species, *N. steinbergi* sp. n. from southwestern Turkmenia. [In Russian.] *Ent. Obozr.* **56**: 171–176. [English translation: *Ent. Rev., Wash.* **56**: 130–133.]

Noyes, J. S. 1979. The West Indian species of Encyrtidae described by L. O. Howard, 1894 and 1897 (Hymenoptera, Chalcidoidea). *Syst. Ent.* **4**: 143–169.

Peck, O. 1963. A catalogue of the nearctic Chalcidoidea (Insecta; Hymenoptera). *Can. Ent.* Suppl. 30: 1–1092.

Perkins, R. C. L. 1906. Leaf-hoppers and their natural enemies (VIII). *Bull. Hawaiian Sug. Plrs' Ass. Exp. Stn* (Ent.) **1**: 239–267.

—— 1907. Parasites of leaf-hoppers. *Bull. Hawaiian Sug. Plrs' Ass. Exp. Stn* (Ent.) **4**: 1–59.

Porter, C. E. 1920. Cambio de nombre genérico [*Brethesia* to *Brethesiella*]. *Revta chil. Hist. nat.* **24**: 16.

Prinsloo, G. L. & Annecke, D. P. 1978. On some new and described Encyrtidae (Hymenoptera: Chalcidoidea) from the Ethiopian region. *J. ent. Soc. sth. Afr.* **41**: 311–331.

—— —— 1979. A key to the genera of Encyrtidae from the Ethiopian region, with descriptions of three new genera (Hymenoptera: Chalcidoidea). *J. ent. Soc. sth. Afr.* **42**: 349–382.

Ratzeburg, J. T. C. 1844. *Die Ichneumonen der Forstinsecten in entomologischer und forstlicher Beziehung*. **1**, 224 pp. Berlin.

Riley, C. V., Ashmead, W. H. & Howard, L. O. 1894. Report upon the parasitic Hymenoptera of the island of St. Vincent. *J. Linn. Soc.* (Zool.) **25**: 56–254.

Risbec, J. 1951. Les Chalcidoïdes de l'Afrique occidentale française. II. Les Microgasterinae de l'Afrique occidentale française. *Mém. Inst. fr. Afr. noire* **13**: 7–409.

—— 1954. Chalcidoïdes et Proctotrupoïdes de l'Afrique occidentale française (4ᵉ Supplément). *Bull. Inst. fr. Afr. noire* (A) **16**: 1035–1092.

—— 1959. Encyrtidae de Madagascar. (Hym. Chalcid.). *Bull. Acad. malgache* (N.S.) **35**: 17–44.

Rosen, D. 1969. A systematic study of the genus *Acerophagus* E. Smith, with descriptions of new species (Hym., Encyrtidae). *Hilgardia* **40**: 41–72.

—— 1976. The species of *Microterys* (Hymenopera: Encyrtidae). An annotated world list. *Ann. ent. Soc. Am.* **69**: 479–485.

Silvestri, F. 1915*a*. Contributo alla conoscenza degli insetti dell' olivo dell'Eritrea e dell'Africa meridionale. *Boll. Lab. Zool. gen. agr. R. Scuola Agric. Portici* **9**: 240–334.

—— 1915*b*. Descrizione di nuovi Imenotteri Calcididi africani. *Boll. Lab. Zool. gen. agr. R. Scuola Agric. Portici* **9**: 337–377.

Smith, E. A. 1880. Biological and other notes on *Pseudococcus aceris*. *N. Am. Ent.* **1**: 73–87.

Subba Rao, B. R. 1957. Some new species of Indian Hymenoptera. *Proc. Ind. Acad. Sci.* (B) **46**: 376–390.

—— 1970. A redescription of *Exoristobia* Ashmead 1904 and description of two new species (Hymenoptera: Encyrtidae). *Proc. R. ent. Soc. Lond.* (B) **39**: 109–113.

—— 1971. New genera and species of encyrtids (Hymenoptera: Encyrtidae). *J. nat. Hist.* **5**: 209–224.

—— 1973. Description of two new species of *Carabunia* Waterston (Hymenoptera: Encyrtidae). *Orient. Insects* **7**: 485–489.

Szelényi, G. 1971. Data to the Mongolian encyrtid fauna (Hym., Chalcidoidea). I. Ergebnisse der zoologischen Forschungen von Dr Z. Kaszab in der Mongolei. Nr. 272. *Acta zool. hung.* **17**: 387–396.

—— 1972. Neue Encyrtiden aus Ungarn (Hymenoptera, Chalcidoidea). *Annls hist.-nat. Mus. natn. hung.* **64**: 347–353.

Tachikawa, T. 1955. Notes on the genus *Anabrolepis* Timberlake, 1920 (Hymenoptera: Encyrtidae). *Mem. Ehime Univ.* (6) **1**: 9–14.

—— 1963. Revisional studies on the Encyrtidae of Japan (Hymenoptera: Chalcidoidea). *Mem. Ehime Univ.* (6) **9**: 1–264.

—— 1978. Hosts of the Encyrtidae in the World (Hymenoptera: Chalcidoidea). *Trans. Shikoku ent. Soc.* **14**: 43–63.

Tachikawa, T. & Valentine, E. W. 1969. A new genus of Encyrtidae from New Zealand (Hymenoptera: Chalcidoidea). *N.Z. J. Sci.* **12**: 546–552.

Thomson, C. G. 1876. *Skandinaviens Hymenoptera.* 4, 192 pp. Lund.

Timberlake, P. H. 1916. Revision of the parasitic hymenopterous insects of the genus *Aphycus* Mayr with notice of some related genera. *Proc. U.S. natn. Mus.* **50**: 561–640.

—— 1918. New genera and species of Encyrtinae from California parasitic in mealy bugs (Hymenoptera). *Univ. Calif. Publs Ent.* **1**: 347–367.

—— 1919*a*. Revision of the parasitic Chalcidoid flies of the genera *Homalotylus* Mayr and *Isodromus* Howard, with descriptions of two closely related genera. *Proc. U.S. natn. Mus.* **56**: 133–194.

—— 1919*b*. Descriptions of new genera and species of Hawaiian Encyrtidae (Hymenoptera). *Proc. Hawaii. ent. Soc.* **4**: 197–231.

—— 1920*a*. Correction of two generic names in Coleoptera and Hymenoptera. *Can. Ent.* **52**: 96.

—— 1920*b*. Description of new genera and species of Hawaiian Encyrtidae (Hym.). *Proc. Hawaii. ent. Soc.* **4**: 409–437.

—— 1922. Notes on the identity and habits of *Blepyrus insularis* Cameron (Hymenoptera, Chalcidoidea). *Proc. Hawaii. ent. Soc.* **5**: 167–173.

—— 1923. Descriptions of two new species of Encyrtidae from Mexico reared from mealy-bugs (Hym., Chalcidoidea). *Proc. Hawaii. ent. Soc.* **5**: 323–333.

—— 1924. Descriptions of new chalcid-flies from Hawaii and Mexico (Hymenoptera). *Proc. Hawaii. ent. Soc.* **5**: 395–417.

—— 1925. Descriptions of new chalcid-flies from Panama and Hawaii (Hymenoptera). *Proc. Hawaii. ent. Soc.* **6**: 173–192.

—— 1926. Some new encyrtid flies. *Proc. U.S. natn. Mus.* **69** (3): 1–34, 2 pls.

—— 1929. Three new species of the hymenopterous family Encyrtidae from New South Wales. *Univ. Calif. Publs Ent.* **5**: 5–18.

—— 1932. Three new parasitic Hymenoptera from the Indo-Malayan Region. *Proc. Hawaii. ent. Soc.* **8**: 153–162.

Trjapitzin, V. A. 1963. On the systematic position of *Coccidencyrtus ambiguus* (Nees) (Hymenoptera, Encyrtidae). [In Russian.] *Ent. Obozr.* **42**: 884–888. [English translation: *Ent. Rev., Wash.* **42**: 479–481.]

—— 1968. A review of the encyrtids (Hymenoptera, Encyrtidae) of the Caucasus. *Trudy̆ vses. ént. Obshch.* **52**: 43–125.

—— 1971*a*. *Parablastothrix plugarui* sp. n. (Hymenoptera: Encyrtidae) parasite of the mining moth *Bucculatrix ulmella* Z. in Moldavia. [In Russian.] *Entom. Moldavii* **1971**: 33–37.

—— 1971*b*. Review of the genera of Palaearctic encyrtids (Hymenoptera, Encyrtidae). [In Russian.] *Trudy vses. ent. Obshch.* **54**: 68–155.

—— 1971*c*. A new species of the genus *Ameromyzobia* (Hymenoptera, Encyrtidae) from the island of Cuba. [In Russian with English summary.] *Zool. Zh.* **50**: 289–291.

—— 1971*d*. A Nearctic representative of the genus *Avetianella* Trjapitzin, 1968 (Hymenoptera, Encyrtidae). [In Russian.] *Ent. Obozr.* **50**: 890–892. [English translation: *Ent. Rev., Wash.* **50**: 507–508.]

—— 1971*e*. New species of parasitic Hymenoptera of *Leptanusia* De Santis 1963 (Hymenoptera, Encyrtidae) genus. [In Russian.] *Izv. Akad. Nauk turkmen. SSR.* (Biol. Ser.) **1971**: 86–89.

—— 1973*a*. The classification of parasitic Hymenoptera of the family Encyrtidae (Hymenoptera, Chalcidoidea). Part I. Survey of the systems of classification. The subfamily Tetracneminae Howard, 1892. [In Russian.] *Ent. Obozr.* **52**: 163–175. [English translation: *Ent. Rev., Wash.* **52**: 118–125.]

—— 1973*b*. Classification of the parasitic Hymenoptera of the family Encyrtidae (Chalcidoidea). Part II. Subfamily Encyrtinae Walker, 1837. [In Russian.] *Ent. Obozr.* **52**: 416–429. [English translation: *Ent. Rev., Wash.* **52**: 287–295.]

—— 1977. New genera and species of parasitic Hymenoptera of the family Encyrtidae (Hymenoptera: Chalcidoidea). *Folia ent. hung.* **30**: 153–166.

Trjapitzin, V. A. & Gordh, G. 1978*a*. Review of genera of Nearctic Encyrtidae (Hymenoptera, Chalcidoidea). [In Russian.] *Ent. Obozr.* **57**: 364–385. [English translation: *Ent. Rev., Wash.* **57**: 257–270.]

—— —— 1978*b*. Review of genera of Nearctic Encyrtidae (Hymenoptera, Chalcidoidea). II. [In Russian.] *Ent. Obozr.* **57**: 636–652.

Viggiani, G. 1966. Ricerche sugli Hymenoptera Chalcidoidea. VI. Generi e specie nuovi per l'entomofauna italiana (Encyrtidae, Aphelinidae, Mymarommidae). *Boll. Lab. Ent. agr. Filippo Silvestri* **24**: 84–105.

Walker, F. 1837. Monographia Chalciditum. *Ent. Mag.* **4**: 349–364, 439–461.

—— 1839. *Monographia Chalciditum.* 2, 100 pp. London.

—— 1846. Characters of some undescribed species of Chalcidites. *Ann. Mag. nat. Hist.* (1) **17**: 108–115, 177–185, 270–272.

—— 1848. *List of the specimens of Hymenopterous insects in the collection of the British Museum,* Part 2, Chalcidites, additional species. iv, 237 pp. London.

Waterston, J. 1928. A new encyrtid (Hym., Chalcid.) bred from *Clastoptera* (Hom., Cercop.). *Bull. ent. Res.* **19**: 249–251.

Westwood, J. O. 1832. Descriptions of several new British forms amongst the parasitic hymenopterous insects. *Phil. Mag.* (3) **1**: 127–129.

—— 1833. Descriptions of several new British forms amongst the parasitic hymenopterous insects. *Phil. Mag.* (3) **3**: 342–344.

—— 1837. Description of a new genus of British parasitic hymenopterous insects. *Ann. Mag. nat. Hist.* (N.S.) **1**: 257–259.

—— 1838–1840. Synopsis of the genera of British insects. *In*: *An introduction to the modern classification of insects.* Vol. 2 (appendix) 158 pp. London.

Index

Invalid names are in *italics*; principal page references are in **bold.**

abilis **236**
abjectus **234**
abnormicornis **183**
abnormis **206**
abtrusus **225**
acacallis **194**
Acerophagoides 113, 152, **169,** 237
Acerophagus 112, 154, **169,** 225, 237
Achrysopophagus 185, 223
aciculatus **173**
aclerdae **215,** 238
Acroaspidia 114, 150, **170,** 171, 237
acuminatus **170**
acutigastris **226**
Adelencyrtus 119, 148, 152, **170,** 172, 237
advena **170**
Aenasioidea **215**
Aenasius 117, 126, 152, 158, **170,** 237
Aeptencyrtus 113, 158, 170, **171,** 237
aestivalis 209
Ageniaspis 142, 162, 165, **171,** 219, 237
Aglyptoideus 174, 238
Alamella **207**
albinotatus **185**
albisetosa 200, **201**
alboclavatus **212**
albopilosus **226**
Allencyrtus 181, 215, 221
Allorhopoideus 195
altensteinii **182**
alula **216**
Amaurilyma 136, 146, 148, 163, **171,** 193, 197
ambiguus **211**
americana **194**
Ameromyzobia 112, 154, **172,** 237
Aminellus 209
Ammonoencyrtus 115, 168, **172,** 174, 236
amoenus **212**
Anabrolepis 116, 122, 152, **172,** 237
Anagyrella 235
Anagyrus 114, 115, 117, 121, 128, 130, 165, **173,** 176, 199, 236, 237, 238
ananaitis **173**
Anarhopus 112, 152, **173,** 237
Anathrix 121, 124, 130, 150, 173, **174,** 237, 238
Andinoencyrtus 142, 150, **174,** 237

angelicus **225**
angulatus **185**
angustifrons (Cicoencyrtus) **186**
angustifrons (Metaphycus) **212**
angustifrons (Pseudaphycus) **225**
Anicetus 115, 168, 169, 172, **174,** 236
annulata (Aphycomastix) **175**
annulatus (Anicetis) **174**
annulipes **188**
antillicola **206**
antoninae **173**
Anusiella 233
Anusioptera 122, 150, **175,** 237
Apentelicus 213
aphelinoides (Ameromyzobia) **172**
aphelinoides (Cibdeloencyrtus) **185**
Aphidencyrtus 150, 167, **175,** 226, 231, 236, 237
aphidiphagus **175**
aphidivorus **175**
Aphycomastix 112, 150, **175**
Aphycomorpha 121, 126, 140, 168, **175,** 237
Aphycus 187, 212
Apoanagyrus 117, 130, 165, 173, **176,** 237
Aprionomastix 223
Apsilophrys 128, 163, **176,** 237, 238
Apterencyrtus 235
apterus **230**
Aratiscus 236
Aratus 236
araucariae 175, 176
Archinus 112, 154, **176,** 187, 191, 218, 219
argentinensis 223, 238
argentipes **235**
argyrus **174**
Arhopoidiella 112, 154, **177**
Arhopoideus 233
armatus **234**
Arrenoclavus 189
Arrhenophagoidea 112, 150, **178,** 237
Arrhenophagus 111, 156, **178,** 237
Aseirba 128, 164, **179,** 197
Asitus 107, 118, 158
Asteropaeus 174
Atelaphycus 111, 150, **179,** 237
aulacaspidis **170**
aurantiaca **206**
aureocincta **175**
australiensis (Anagyrus) **173**
australiensis (Tetracnemoidea) **233**
australiensis (Tetracnemus) **233**
australiensis (Trichomasthus) **234**
Avetianella 140, 160, **179,** 228, 237
Aztecencyrtus 120, 150, **180,** 237

bacchae **231,** 239
Baeoencyrtus 111, 160, **180**
baezi **195**
bahiensis **206,** 238
bakeri (Litomastix) **209**
bakeri (Tetracnemus) **233**
bambeyi **199**
Batrachencyrtus 189
bellator **173**
bennetti **203**
Bennettisca 118, 150, **180,** 221, 236
Berecyntiscus 209
Berecyntus 209
bicarinata 223
bicolor (Bothriocraera) **182**
bicolor (Encyrtus) **195**
bicoloripes **219**
bicristatus **193**
bifasciata **189**
bifasciatus **173,** 238
bifasciatella **233**
biformis **223**
bimaculatus **187**
blanchardi (Coccidencyrtus) **188**
blanchardi (Dicarnosis) 117, **193**
blanchardi (Hexacladia) **203**
Blanchardiscus 112, 154, 181, **182**
Blatticida 185
Blepyrus 126, 146, 148, 152, **182,** 237
bolivari **223**
bollowi **226,** 239
bolowi **170,** 171
bonariensis (Ammonoencyrtus) **172**
bonariensis (Pelmatencyrtus) **221**
bosqi **203**
Bothriocraera 112, 154, **182,** 237
Bothriothorax 124, 136, 166, **182,** 202, 237
Boucekiella 107, 118, 163
boucheanum **189**
Brachyplatycerus 111, 164, **183**
brachyptera **226**
brasiliensis (Aenasius) **170**
brasiliensis (Aphidencyrtus) **175**
brasiliensis (Desantisella) **191**
brasiliensis (Hemencyrtus) **202,** 238
brasiliensis (Metaphycus) **212**
brasiliensis (Paramucrona) 219, **220**
brasiliensis (Parencyrtus) **221**
brasiliensis (Trichomasthus) **234,** 239
brethesi (Aenasius) **170**
brethesi (Leptomastidea) **206**
Brethesia 183
Brethesiella 126, 160, **183,** 237, 238
brevicauda **203**
brevicornis (Amaurilyma) **171**
brevicornis (Tetracnemoidea) **233,** 239
brevistigma **173**
brittanica **235**
brivicollis **233**
bruchi **171**
bucculatricis **209**
bucculentus **183**
bulyginskayae **172**

caeruleus **170**
californica (Gahaniella) **197**
californicus (Apoanagyrus) **176**
callidii **189**
Calliencyrtus 121, 150, **183**
Calluniphilus 226
Calocerinus **108**
Calometopia 219
calypso **209,** 238
capnodiobia **179**
capsicum **176,** 238
Carabunia 124, 162, **184,** 236
carinata **177**
cariocus **170**
casali **202**
caudata **179,** 239
celia **199,** 200
cerapterocera 189
Cerapterocerus 107, 115, 167
Cerchysius 128, 150, 179, 180, **184,** 197, 223, 237
ceroplastae 136, **212,** 238
ceroplastodis **174**
ceylonensis **174**
Chalcaspis 126, 152, **184,** 237
chalconotus **208**
chapadae **170**
Cheiloneuroides 193
Cheiloneurus 114, 116, 120, 164, 166, 168, 169, 170, 184, 206, 236, 237, 238
Chestomorpha 223
chilensis (Anagyrus) **173**
chilensis (Parablastothrix) **219,** 238
Chiloneurinus 235
chionaspidis (Adelencyrtus) **170**
chionaspidis (Arrhenophagus) **178,** 179
chlorinus **223**
chrysomphali **216**
chrysopae 199, **217,** 239
Chrysoplatycerus 115, 158, 170, **185,** 237, 238
Chrysopophagus 184
Chrysopophilus 213, 238
Cibdeloencyrtus 144, 150, **185**
Cicoencyrtus 146, 160, **186,** 191, 218
Cirrhencyrtus 120, 140, 158, 160, 180, **187,** 237
citriculus **185**
citrina (Gyranusoidea) **199**
citrinus (Acerophagus) **169**
clavatus **235**
clavicornis **182**
claviger **209**
clisiocampae **217**
Coccidaphycus 113, 154, **187,** 236
Coccidencyrtoides 188
Coccidencyrtus 117, 119, 132, 148, 168, **188,** 218, 237
coccidivorus **173**
coccidophaga **183,** 238
Coccidoctonus 136, 142, 165, **188,** 212, 236, 237, 238
Coccidoxenus 234
coccois **169**
Coccophoctonus 182
cockerelli **203**
Coelaspidia 113, 158, **188,** 237
Coelopencyrtus 119, 148, 158, **189,** 238
colocense **233**
colombiensis **185**
coloripes **178**
Comperencyrtus 233
Comperia 117, 156, **189,** 236
Comperiella 115, 168, **189,** 237
compressicornis **184**
compressiventris **213,** 238
Comys 195
concupiens **200**
conformis 134, **195,** 196
confusor 217, **218**
confusus **202**
connectens **170**
consobrinus **213**
convexus (Desobius) **192**
convexus (Parechthrodryinus) **221**
Copidencyrtus 176, 238
Copidosoma 128, 132, 138, 148, 163, 176, **189,** 209, 237
corvina **235**
creona **217**
cristata **203**
Cristatothorax 185
cristatus (Cheiloneurus) **185**
cristulata **204**
crouzelae **216**
cultrata 179
cupreicollis **185**
cyanea (Plagiomerus) **222**
cyaneus (Trichomasthus) **234**
Cyderius 136, 150, 175, **190**

dactylopii (Blepyrus) **182**
dactylopii (Leptomastix) **207**
dactylopii (Prochiloneurus) 223, **224,** 238, 239
dalmanii **199**
debilis **169**
Deloencyrtus 121, 128, 150, **191,** 216
denieri **188**
depressus **170**
Desantisella 124, 156, **191,** 236, 237
desantisellus **226**
desantisi **190**
Desobius 119, 144, 156, 171, **192,** 197
destructor **193**
diaspidis **222**
Dicarnosis 150, **193,** 212
dimorpha **200**
discolor **212,** 238
dispar **206,** 238
diversicolor **187,** 238
diversicornis (Anagyrus) **173**

diversicornis (Apoanagyrus) **176**
diversicornis (Tetracnemus) **233**
Diversinervus 116, 162, 165, 169, **193,** 236
divisus **231**
dysmicocci **225**

Echthrobaccha 231
Echthrodryinus 140, 150, 167, 169, 178, **193,** 199, 217, 236, 237
Echthroplexiella 111, 156, 185, **194**
Ectroma 114, 150, **194**
Ectromatopsis 114, 165, **194**
ehrhorni **187**
elegans (Cheiloneurus) 184, **185**
elegans (Diversineurus) **193**
elegans (Microterys) **213**
Encyrtolophus 185
Encyrtus 120, 162, 163, 164, **195**
ensifer **188**
Epaenasomyia 202
Epidinocarsis 173
Epiencyrtoides 170
Epiencyrtus 124, 126, 146, 150, **195,** 237
epytus **235,** 239
Ericydnus 122, 162, **195,** 237, 238
eriococci (Atelaphycus) **179**
eriococci (Zaomma) **235**
eruptor **212**
Euaphycus 212
Eucomys 195
europaea (Timberlakia) **233**
europaeus (Rhopus) **226**
Euryrhopalus 126, 148, 154, **196,** 237
Exoristobia 119, 140, 150, 195, **196,** 237
extranea **172**

fasciatipennis **223**
felix **174**
ferrisi **185**
ferrisianae **225**
flaminius **203**
flandersi **170**
flava (Mariola) 210, **211**
flaviclava (Lohiella) 209, **210,** 238
flaviclava (Rhytidothorax) **226,** 239
flavicollis **185**
flavicornis **226,** 227, 239
flavidulus **225**
flavifrons 204, **205**
flavigena 180, **181**
flavipes (Bothriocraera) **182**
flavipes (Meromyzobia) **212**
flavipes (Neapsilophrys) 215, **216**
flaviptera **229**
flavitibiae **231,** 239
flavus (Acerophagus) **169**
flavus (Aztecencyrtus) **180**
flavus (Metaphycus) **212**
flavus (Microterys) **213**
floridana **209**
Forcipestricis 144, 146, 156, 164, 166, **196,** 233, 237
formosus **200**
frontalis **170**
frontatus **213**
fullawayi **235**
fulvescens **194**
fulviceps **213**
fumipennis **212**
fuscicollis **171**
fuscipalpis 184, **223**

gahani (Cheiloneurus) **185,** 238
gahani (Lochitoencyrtus) **209**
Gahaniella 117, 118, 132, 138, 164, 166, **197,** 236, 237
gargaris **189**
gaseaui **196**
Gibberella 219
glabriscutellum **236**
glauca **199**
gloriosa (Copidosoma) **189**
gloriosa (Gonzalezia) **197**
Gonzalezia 134, 164, **197**
gracilicornis **211,** 238
gracilis **176,** 238
graminicolens **173**
Grandoriella 196, 238
greeni **173**
grioti **188**
gripha **212**
griseus **225**
Grissellia 138, 148, 168, **197**
guttofasciatus **212,** 238
Gymnoneura 199
Gyranusa 173
Gyranusia 173, 238
Gyranusoidea 117, 165, 173, **199,** 237

Habrolepis 115, 152, **199,** 236, 237
Habrolepistia 189
Habrolepoidea 144, 150, 195, **199**
Habrolepopterygis 174
Habrolepopteryx 108
Hadrencyrtus 230
Hambletonia 115, 154, 170, **200,** 237
haywardi **195**
Hazmburkia 200
hederaceus 212
Helegonatopus 130, 134, 154, 167, **200,** 208, 236, 237
Helmecephala 119, 136, 166, **200**
helvolus **212**
Hemaenasius 116, 117, 128, 164, 183, **202**
Hemaenasoidea 203
Hemencyrtus 121, 122, 124, 128, 130, 134, 136, 165, 166, 179, **202,** 221
herbertii **202,** 239

Heterarthrellus 173
Hexacladia 121, 152, **203,** 223, 236
heydeni **233**
hirtus **226,** 227, 239
hispanicus **209**
histrio **206**
Holcencyrtus 209
Holcothorax 171
Homalopoda 111, 152, **203,** 237
Homalotylus 120, 121, 126, 158, 162, **203,** 237
Homosemion 115, 150, 172, **203,** 237
hookeri **204**
Hoplopsis 124, 150, **204**
Howardia 195
Howardiella 195
Hungariella 233
Hunterellus 117, 119, 162, **204,** 227, 236
hyalinistigma **190**
hyettus **170**

iceryae (Aztecencyrtus) **180,** 238
iceryae (Isodromus) **206**
Iceromyia 116, 118, 165, 168, **204**
indica **203**
infelix **195**
infida **195**
inimicus **185**
injuriosa **231**
inquisitor **235**
insolitus (Anagyrus) **173**
insolitus (Prochiloneurus) **233**
insulanus 213, **214**
insularis (Aenasius) **170**
insularis (Blepyrus) **182**
insularis (Zeteticontus) **236**
io **223**
Isodromus 126, 142, 158, **206,** 236

johnsoni **217**
josephi **194**
jucundus **173**

kaalae **189**
Kaszabicyrtus 226
kirkpatricki **196**
koebelei **203**
koehleri 189, **190**
komabae **189**
kotynskyi **213**
Krishneriella 174
kuscheli **191**
kuwanae **217**

laevigatus **236**
lamasi **196,** 238
lambinus **235**
latifrons **183**
latipes **203**
latiscapus **217**
lecaniorum **195**
Lepidaphycus 203
Leptanusia 206, 238
Leptomastidea 121, 165, **206,** 237, 238
Leptomastix 122, 130, 165, 173, 176, **206,** 237
Limastotix 209
Liocarus 223
Lirencyrtus 130, 167, **207**
Litomastiellus 209
Litomastix 138, 142, 160, 190, **208,** 237
littoralis **195**
Lochitoencyrtus 136, 156, **209**
Lohiella 132, 150, **209**
longipes **183**
longiscapus **170**
longisetaceus 185
lopesi 189
lopezi **176**
loretanus **185**
lounsburyi **212**
lucida **184**
lusitanicum **226**
luteolus (Acerophagus) **169**
luteolus (Metaphycus) **212**

maculicornis 119, **188**
maculipennis (Meromyzobia) 191, 212
maculipennis (Tetracnemus) **233**
maculipes **212,** 238
malenotus **176,** 238
malloi 132, **188**
maplei **170**
Mariola 118, 150, **210**
marlatti **226**
Masencyrtus 200
Masia 233
masii **170**
masneri 227, **228**
matritensis **173**
mayri **204**
Melanaphycus 212
Mendozaniella 203
Mercetencyrtus 134, 138, 150, 168, **211**
merceti **189**
Mercetia 226
Mercetiella 212
Meromyzobia 112, 152, 191, **212,** 236
mesograptae **231**
Metacheiloneurus 185, 238
metallicus **221**
Metallon 194
Metallonoidea 235
Metaphycus 108, 117, 118, 126, 136, 140, 144, 160, 162, 172, 179, 180, 193, 194, **212,** 230, 235, 236, 237, 238
Metaplatycerus 185, 238
Metapterencyrtus 235
mexicana (Hexacladia) **203**

mexicanus (Blepyrus) **182**
mexicanus (Encyrtus) **195**
mexicanus (Homalotylus) **203**
mexicanus (Metaphycus) **212**
mexicanus (Trichomasthus) **234,** 239
mexicanus (Tyndarichoides) **234**
microphagus **235**
Microterys 117, 124, 162, 164, 165, 167, **213,** 236, 237
minutus (Brachyplatycerus) **183**
mirabilis (Encyrtus) **195**
mirabilis (Homalotylus) **203**
Mirastymachus 226
Mirocerus 226
Mirrencyrtus 236
moderatus **170**
moestus **185**
montana **193**
monticolens **212**
montivagus **176,** 238
Moorella 119, 150, **213,** 236, 238
morio **223**
Mucrencyrtus 114, 122, 130, 134, 136, 163, 181, **213,** 221, 236
mundus **225**
myersi **184**
Mymariella 178
myrmicoides **170**

nacoliae **222**
Neapsilophrys 128, 150, **215,** 237
nearctica **231**
Neoaenasioidea 203
Neoanisotylus 187
Neococcidencyrtus 120, 122, 148, 168, **216,** 218, 237
Neocopidosoma Blanchard 183
Neocopidosoma Ishii 189
Neodusmetia 114, 158, **216,** 237, 238
Neoprochiloneurus 223
Nesencyrtus 189
niger **212,** 238
nigriaxillae **206**
nigrescens **185**
nigricans (Coccidaphycus) **187**
nigricans (Tachardiobius) **231**
nigriceps (Anagyrus) **173**
nigriceps (Protyndarichoides) **224**
nigriclavus **226**
nigricornis **231,** 239
nigroclavatus **226**
nikolskajae **200**
nitidus **221,** 238
Noblanchardia 183, 238
Nobrimus 203
notativentris **169**
Notoencyrtus 212, 238
nubeculus **231**
nubilipennis (Acerophagus) **169**
nubilipennis (Habrolepis) **199**

oaxacae 212, 238
obesus 142, **188**
occupatus **176**
ocellatus **174**
oculata **203**
odonaspidis **170**
odyneri **189**
oeceticola **176**
ogloblini 193, **212,** 238
Ooencyrtoides 226
Ooencyrtus 114, 119, 132, 138, 148, 150, 163, 166, 167, 178, 194, 199, **217,** 226, 236, 237
orbitalis **206**
osborni **188**
oviductus **223**

pachypsyllae **226**
pacificus **170**
pallidus **169**
paludatus **195**
Paludencyrtus 200
Papaka 146, 148, 160, **217**
Parablastothrix 119, 152, **218,** 237
Paracalocerinus 233
Parachrysopophagus 223
Paracopidosomopsis 209
Parahomalopoda 222, 238
Paraleurocerus 142, 156, 171, **219,** 237
Paralitomastix 148, 163, 190, **219,** 237
Paramucrona 134, 150, 182, **219,** 236
Paranusia 173, 238
Paraplatycerus 185
Parastenoterys 226
Parataneostigma 206
Parechthrodryinus 122, 124, 130, 136, 146, 166, 167, **221,** 225, 237
Parencyrtus 111, 150, **221,** 226
parlatoriae **178**
parvula **226**
paulistus **170**
Pauridia 144, 158, 169, **221,** 237
peckhami **195**
pectinatum **173**
Pelmatencyrtus 113, 150, 170, **221,** 237
Pentacnemus 209
Pentalitomastix 113, 160, 190, **222,** 237
perdignus **225**
peregrina (Pauridia) **221**
peregrina (Tetracnemoidea) **233,** 239
pergandei **184**
perhispidus **226,** 227, 239
Perissodromus 183
personatus **170**
peruviensis **222,** 238
Pezobius 194
Pheidoloxeniscus 222

Pheidoloxenus Ashmead 113, 150, **222,** 237
Pheidoloxenus Girault 222
phenacocci **170**
philippinensis **196**
Philoponectroma 173, 238
Pholidoceras 226
Pholidocerodes 226
pia **189**
piceae **233**
pinicola **193**
piso **226**
Placoceras **233**
Plagiomerus 111, 152, **222,** 237, 238
planiscutellum **235**
Platencyrtus 107, 118, 163, 211
platensis **230**
Platylyca 128, 150, **222**
platys **180**
plaumanni **191**
plethorica **222**
polychromus **194**
porteri **173,** 238
portoricensis (Forcipestricis) **196**
portoricensis (Metaphycus) **212,** 238
portoricensis (Trichomasthus) **234**
praenitens **185**
prenidis **217**
pretiosus (Euryrhopalus) **196**
pretiosus (Tetracnemoidea) **233**
prima (Pseudhomalopoda) **225**
primus (Anicetus) **174**
primus (Lirencyrtus) 207, **208**
Prionomastix 121, 124, 162, **223,** 236
Prionomitus 111, 150, 184, **223,** 236
Prochiloneurus 116, 120, 121, 168, **223,** 236, 237
propinquus **196**
Propsyllaephagus 226
Prorhopoideus 195
prosopidis **225**
Protanagyrus 173
Protyndarichoides 136, 150, **224**
Protyndarichus 221
Pseudanusia 189
Pseudaphycus 112, 154, 169, **225,** 237
Pseudhomalopoda 111, 152, **225,** 237
Pseudleptomastix 173, 206
Pseudlitomastix 217
pseudococci (Anagyrus) **173**
pseudococci (Leptomastidea) **206**
pseudococcina **200**
Pseudolitomastix 222
pseudophanes **200**
Psilomirinus 225
Psyllaephagus 132, 138, 150, 163, 175, **226,** 236
pulchellus **223**
pulcher **185**
pulchra **185**
pulchricornis (Anagyrus) **173**
pulchricornis (Zaomma) **235**
pulchrior **196**
pulvinariae **185**
punctatus **170**
putophilus **235**
pyelae **226**

quadraticeps **222**
quadricolor **195**
quadridentatus **170**
quadrimaculati **231**
Quaylea 188, 238
quintanai **174**

regularis **170,** 171
reticulatus (Metaphycus) **212**
reticulatus (Paraleurocerus) **219,** 238
rex **223**
Rhopoideus 169
Rhopus 114, 118, 140, 164, **226,** 237
Rhytidothorax 119, 122, 124, 132, 136, 140, 144, 146, 158, 164, 195, 210, 221, 225, **226**
Richardsius 235
Rileya 185
Rotrencyrtus 170
rotundiformis 223, **226**
rouxi **199**
rusti **212,** 238
rustica **174,** 238

saccharalis **193**
sacchariicola **173**
saissetiae **197**
sangwani **216**
Scelioencyrtus 226
sceptriger **213**
Sceptrophorus 213
Schedioides 200
Schedius 217
schwarzi **196**
scutellaris **182**
scutellata (Paraleurocerus) **219**
scutellatus (Zeteticontus) **236**
seini **223**
semifacta **194**
sheldoni **235**
Shenahetia 118, 142, 168, **227,** 232
silvai **231**
silvestrii (Copidosoma) **190,** 238
silvestrii (Tachardiobius) **231**
similis **170,** 171
Simmondsiella 132, 150, 227, **229**
smithii **203**
Solenaphycus 111, 154, **230**
Solenoencyrtus 113, 144, 150, **230**
Sophencyrtus 203
sordidus **196**
splendens **185**
squammulata **206,** 207
stanleyi **212**

Stemmatosteres 111, 154, **230,** 237
Stenoteropsis 234
Stenoterys 206
submetalica **194**
submetallicus **217**
superbus **193**
swederi **195**
sydneyensis **173**
sylvicola **193,** 238
sylvius **213**
Synaspidia 196
Syrphidencyrtus 231, 238
Syrphophagus 134, 140, 150, 164, 167, 168, 175, 194, 211, **230,** 237, 238
Szelenyiola 140, 160, 228, **231,** 237

Tachardiobius 138, 160, **231,** 237
tachigaliae **170**
Tachinaephagus 107, 124, 136, 156
Tanaomastix 206
Tanyencyrtus 118, 142, 167, 229, **231,** 237
tanystis **173**
teciae **219**
terebrata (Grissellia) 197, **198**
terebratus (Anagyrus) **173**
terminalis **203**
tertia **197**
Tetarticlava 113, 150, **232**
Tetracladia 233
Tetracnemella 234
Tetracnemoidea 113, 152, 174, 178, **233,** 237
Tetracnemopsis 233
Tetracnemus 114, 152, **233,** 237
Tetralophidea 233
Tetralophiellus 233
texana (Tetracnemus) **233**
texanus (Acerophagus) **169**
thebe **209**
thomsoniscae **235**
thyreodontis **195**
Thysanomastix 203
tiliaris **223**
Timberlakia 112, 154, 169, 225, **233,** 237
Tineophoctonus 121, 150, **234, 237**
townsendi **203**
Trechnites 188
trellesi 175, **226**
triangularis **169**
Trichomasthus 140, 164, 167, 229, 230, **234,** 236, 237
tricolor **173**
tricoloricornis **213**
trifasciata **191**
Trimorphocerus 182
trinidadensis (Apoanagyrus) **116**
trinidadensis (Coccidoctonus) **188**
trinidadensis (Ooencyrtus) **217,** 239
truncatella **209**
tucumanus **234,** 239
Tyndarichoides Girault 120, 126, 150, **234**
Tyndarichoides Mercet 221
Tyndarichus 193

urbicola **190**
urocerus **184**
utilis **225**

vadosus **170**
varicornis (Hemaenasius) **202**
varicornis (Paralitomastix) **219**
venatorius **217**
vendicus **226**
Verdunia 189
vespertina **218**
vexans **170**
vianai (Encyrtus) **195**
vianai (Solenaphycus) **230**
virescens **190**

waterstoni **184**
Waterstonia 187
westwoodi **233**
wheeleri Ashmead 222
wheeleri Girault 222
whittieri **188,** 238

Xanthoencyrtus 226
Xenocomys 216
Xiphomastix 173

yoshimotoi **232**

Zaomma 117, 130, 144, 169, **235,** 237
Zaplatycerus 115, 156, 170, **235,** 237
Zarhopaloides 200
Zarhopalus 115, 158, 170, **235,** 237
zebratus **212**
Zeteticontus 108, 119, 134, 142, 158, 163, 166, 202, **236,** 237
zetterstedti **172**

Other British Museum (Natural History) Publications on the Hymenoptera:

African bees of the genera *Ceratina*, *Halictus* and *Megachile*. T. D. A. Cockerell.

1937, xvi+254 pp, 50 text figures, 8vo, £7·15

A revision of the Leucospidae (Hymenoptera: Chalcidoidea) of the World. Z. Bouček.

Bull. British Museum (Natural History) Entom. Supp. No 23, 1974, 241 pp, 272 text figures, 4to paper, £14·00

The Pteromalidae of north-western Europe (Hymenoptera: Chalcidoidea). M. W. R. de V. Graham.

Bull. British Museum (Natural History) Entom. Supp. No 16, 1969, 908 pp, 686 text figures, 4to paper, £33·00

A revisional study of the Masarid wasps (Hymenoptera: Vespoidea). O. W. Richards.

1962, 294 pp, 241 text figures, 4to, £9·35

The social wasps of the Americas excluding the Vespinae. O. W. Richards.

1978, 571 pp, 159 text figures, 4 plates (colour), 4to cloth, £32·50

Publications Sales
British Museum (Natural History)
Cromwell Road
London SW7 5BD

Standing orders placed by educational institutions earn a discount of 10% off our published price.

Titles to be published in Volume 41

A revision of the western Palaearctic species of the genus *Meteorus* (Hymenoptera: Braconidae). By T. Huddleston.

A revision of the Old World Polymorphanisini (Trichoptera: Hydropsychidae). By P. C. Barnard.

A review of the genera of Neotropical Encyrtidae (Hymenoptera: Chalcidoidea). By John S. Noyes.

A revision of the British species of *Dendrocerus* Ratzeburg (Hymenoptera: Ceraphronoidea) with a review of their biology as aphid hyperparasites. By N. D. M. Fergusson.

A revision of the Pacific species of *Conocephalus* Thunberg (Orthoptera: Tettigoniidae). By Linda M. Pitkin.

Printed by The Whitefriars Press Ltd, London and Tonbridge

BRITISH MUSEUM
GENERAL
23 DEC 1980
LIBRARY
NATURAL HISTORY

Bulletin of the
British Museum (Natural History)

A revision of the British species of *Dendrocerus* Ratzeburg (Hymenoptera: Ceraphronoidea) with a review of their biology as aphid hyperparasites

N. D. M. Fergusson

Entomology series
Vol 41 No 4 18 December 1980

The *Bulletin of the British Museum* (*Natural History*), instituted in 1949, is issued in four scientific series, Botany, Entomology, Geology (incorporating Mineralogy) and Zoology, and an Historical series.

Papers in the *Bulletin* are primarily the results of research carried out on the unique and ever-growing collections of the Museum, both by the scientific staff of the Museum and by specialists from elsewhere who make use of the Museum's resources. Many of the papers are works of reference that will remain indispensable for years to come.

Parts are published at irregular intervals as they become ready, each is complete in itself, available separately, and individually priced. Volumes contain about 300 pages and are not necessarily completed within one calendar year. Subscriptions may be placed for one or more series. Subscriptions vary according to the contents of the Volume and are based on a forecast list of titles. As each volume nears completion, subscribers are informed of the cost of the next Volume and invited to renew their subscriptions. Orders and enquiries should be sent to:

Publications Sales,
British Museum (Natural History),
Cromwell Road,
London SW7 5BD,
England.

World List abbreviation: *Bull. Br. Mus. nat. Hist.* (Ent.)

© Trustees of the British Museum (Natural History), 1980

ISSN 0524-6431

Entomology series
Vol 41 No 4 pp 255–314

British Museum (Natural History)
Cromwell Road
London SW7 5BD

Issued 18 December 1980

BRITISH MUSEUM
GENERAL
23 DEC 1980
LIBRARY
NATURAL HISTORY

A revision of the British species of *Dendrocerus* Ratzeburg (Hymenoptera: Ceraphronoidea) with a review of their biology as aphid hyperparasites

N. D. M. Fergusson

Department of Entomology, British Museum (Natural History), Cromwell Road, London SW7 5BD

Contents

Synopsis . . . 255
Introduction . . . 255
Terminology and methods . . . 256
Abbreviations . . . 257
Depositories . . . 257
Suprageneric classification . . . 257
  Key to families and subfamilies of the Ceraphronoidea . . . 257
Generic classification in the Megaspilidae . . . 258
  Key to the British genera of Megaspilidae . . . 258
Dendrocerus Ratzeburg . . . 259
  Subgenera . . . 261
  Synonymic list of British species . . . 261
  Key to British species . . . 263
  Species descriptions . . . 266
Review of the biology of *Dendrocerus* . . . 293
  Host aphid list for *Dendrocerus* species . . . 293
  List of the Aphidiidae (Hymenoptera) parasitized by *Dendrocerus* . . . 295
  Other hosts . . . 297
  Host information on some non-British species of *Dendrocerus*. . . . 300
Non-British species . . . 301
Doubtfully placed species . . . 309
Acknowledgements . . . 309
References . . . 309
Index . . . 313

Synopsis

The species of *Dendrocerus* occurring in Britain are revised; 72 nominal species are involved, of which 14 are considered to be valid. Six species are recorded as British for the first time and 17 new specific synonyms are established. All the European and some non-European species are discussed. Keys are given to the families and subfamilies of Ceraphronoidea, to the genera of Megaspilidae and to the British species of *Dendrocerus*. The genus *Dendrocerus* is redefined and its subgenera discussed, and one new generic synonym established. The biology of each species is discussed and the biology of the genus as a whole is reviewed.

Introduction

Dendrocerus Ratzeburg is the most economically important genus of the Ceraphronoidea as it contains most, if not all, of the aphid hyperparasites known from this superfamily. Species of *Dendrocerus* are also associated with other Homoptera, and with Neuroptera and Diptera. The

Bull. Br. Mus. nat. Hist. (Ent.) **41** (4): 255–314

Issued 18 December 1980

genus has a world wide distribution except that it has not yet been recorded from the Madagascan region.

The original idea for this study came from Dr V. F. Eastop. As a result of discussions with him and other aphid-workers, it has been possible to obtain many new host records and to present the data in a way which should be useful to them as well as to hymenopterists. The principal aims of this study are to distinguish *Dendrocerus* from other genera of Ceraphronoidea, especially *Conostigmus,* to redefine the limits of the species in *Dendrocerus,* to establish the extent of the British fauna, and to assess the basic host-parasite relationships. In addition, the subgenera have been critically reviewed.

In the course of this work nearly 3000 specimens have been examined, and most of the European species were found to occur in Britain. Examination of much foreign material, especially a large Dutch collection given to the British Museum (Natural History) by Dr Evenhuis, has helped to clarify the taxonomy and add a number of host records.

Terminology and methods

The morphological nomenclature used in this work follows that of Richards (1977) and Snodgrass (1935). The terms thorax and gaster have been used in preference to the 'mesosoma' and 'metasoma' used by Dessart (1972*a*). The microsculpture terminology follows Eady (1968). The term frontal dent refers to a small median depression on the frons, closer to the interantennal carina than to the median ocellus. This is the 'frontal pit' of Dessart (1972*a*) but not the same as the 'frontal pit' used by Bin (1977). The preoccipital crescent (Figs 25, 26) is a central area behind the lateral ocelli which is almost semicircular in shape. It is not as narrow or as well defined as the analogous postocellar area of some sawflies (Hymenoptera: Symphyta). The gastral collar (Figs 18–20) is a large projection around the petiole arising from the main tergite and sternite of the gaster. The term notaulices has been used for the pair of long furrows, one on each side of the median mesonotal furrow (Figs 13–17), which some authors have incorrectly called parapsidal furrows. Two other pairs of furrows (Fig. 14) are sometimes present as short lines; one pair at the anterior margin of the mesonotum close to the median furrow, the other pair half way down the mesonotum exterior to the notaulices. As the terminology of these furrows is confused I have followed Dessart (1972*a*) in calling them collectively the secondary furrows.

A standardized arrangement of information has been adopted for each species. The synonymy contains all nomenclatural changes but it was thought unnecessary to include every reference to the species. The species description is not based solely on type-material as it includes a consideration of the infraspecific variation. The male has been characterized separately, but only features differing from the female have been mentioned. The biology section contains all published host records and as many new records as it has been possible to obtain. The information has been presented as follows:

x♂, y♀, host/primary parasite/host plant, date of collection or emergence (authority for record if previously published).

A dash has been inserted in the appropriate place if the host, parasite or host plant is unknown. The records are listed in alphabetical order. The discussion of the biology is based on the classification of faunistic complexes employed by Starý (1970: 312).

All measurements used in the text are maximum distances unless otherwise stated. In males of *D. halidayi* and *D. ramicornis* the antennal process is excluded from the measurement of segment breadth. The lateral length of the head is measured from the vertex to the base of the mandible. The length of the scutellum is measured from the mesonotal border to the apex of the scutellum, and the breadth is taken as the maximum distance across the raised area. The length and breadth of the pterostigma are measured respectively parallel and perpendicular to the front edge of the wing. (The wing edge must not be curled over, making the pterostigma appear long and narrow.)

In this paper the classification and nomenclature of aphids has been taken from Eastop & Hille Ris Lambers (1976) and Kloet & Hincks (1964: 67); and that of the Aphidiidae from Kloet & Hincks (1978: 61), Mackauer (1968), Starý (1973) and Takada (1973: 1).

Abbreviations

AI, AII, AIII, AIV, etc. – Antennal segments one, two, three, four, etc. The scape is AI, the pedicel AII and the first flagellar segment is AIII.

L/B – Length divided by the breadth of a structure, that is the ratio of the length to the breadth with the breadth expressed as one.

I.C.Z.N. – *International Code of Zoological Nomenclature.*

Depositories

The following abbreviations have been used for depositories containing type- or other material which has been examined.

MP, Amiens	Musée de Picardie, Amiens, France
MNHU, Berlin	Museum für Naturkunde der Humboldt-Universität, Berlin, East Germany
BMNH	British Museum (Natural History), London, England
IRSNB, Brussels	Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium
TM, Budapest	Természettudományi Múzeum, Budapest, Hungary
Chambers coll.	Collection of Dr V. Chambers, Meppershall, Bedfordshire, England
NMI, Dublin	National Museum of Ireland, Dublin, Ireland
IP, Eberswalde	Institut für Pflanzenschutzforschung, Eberswalde, East Germany
MZU, Florence	Museo Zoologico della specola Università degli studi, Florence, Italy
MHN, Geneva	Muséum d'Histoire Naturelle, Geneva, Switzerland
MCSN, Genoa	Museo Civico di Storia Naturale, Genoa, Italy
RES, Harpenden	Rothamsted Experimental Station, Harpenden, England
ZMU, Helsinki	Zoological Museum of the University, Helsinki, Finland
UM, Kuala Lumpur	University of Malaya, Kuala Lumpur, Malaya
MCM, Liverpool	Merseyside County Museum, Liverpool, England
ZI, Lund	Zoologiska Institution, Lund, Sweden
NHM, Maastricht	Natuurhistorisch Museum, Maastricht, Netherlands
MM, Manchester	Manchester Museum, Manchester, England
ZMMLSU, Moscow	Zoological Museum of the Moscow Lomonosov State University, U.S.S.R.
UM, Oxford	University Museum, Oxford, England
IP, Paris	Institut Pasteur, Paris, France
MNHN, Paris	Muséum National d'Histoire Naturelle, Paris, France
NR, Stockholm	Naturhistoriska Riksmuseet, Stockholm, Sweden
MCSN, Verona	Museo Civico di Storia Naturale, Verona, Italy
NM, Victoria	National Museum of Victoria, Melbourne, Victoria, Australia
IPO, Wageningen	Instituut voor Plantenziektenkundig Onderzoek, Wageningen, Netherlands
USNM, Washington	National Museum of Natural History, Washington D.C., U.S.A.

The specimens listed under 'Material examined' without a named depository are in the BMNH.

Suprageneric classification

The Ceraphronoidea consist of two families: Ceraphronidae and Megaspilidae. The Megaspilidae are further divided into the subfamilies Megaspilinae and Lagynodinae. The following key has been designed for ease of use; for this reason characters best seen in slide preparations (e.g. genitalia characters) have not been used.

Key to the families and subfamilies of the Ceraphronoidea

1 Midleg with one tibial spur; mesonotum without notaulices (except *Ceraphron abnormis* Perkins, which has mesepisternum strongly striate), with or without median longitudinal furrow; longer tibial spur of foreleg not forked apically; antenna eight- to eleven-segmented . . . **CERAPHRONIDAE**

– Midleg with two tibial spurs; mesonotum, at least anteriorly, with notaulices and nearly always with median longitudinal furrow, or if notaulices absent then pronotum strongly elongate and ocelli absent or forewing has only costal vein and gastral collar has three carinae; mesepisternum with or without striations; longer tibial spur of foreleg forked apically (Fig. 11); antenna eleven-segmented **(MEGASPILIDAE)** 2

2 Ocelli usually absent; pronotum markedly elongated, mesonotum reduced (Fig. 12), gastral collar with three distinct dorsal carinae (Fig. 12). Apterous, females . . **LAGYNODINAE** (part)

– Ocelli present; pronotum and mesonotum normal, or if (rarely) thorax is modified then gastral collar has many carinae. Mostly macropterous, males and females 3

3 Forewing with large, obvious pterostigma (Figs 1, 33–36, 38–46); in brachypterous forms large pterostigma is conspicuous near wing apex (Fig. 9) (except in *Conostigmus dimidiatus* (Thomson), in which median longitudinal furrow of mesonotum is absent posteriorly); gastral collar not with three carinae, usually with many . . . . . . **MEGASPILINAE**

– Forewing without pterostigma, or pterostigma linear (Fig. 10) and longitudinal furrow complete; gastral collar with three distinct carinae dorsally (Fig. 12) . . . **LAGYNODINAE** (part)

Generic classification in the Megaspilidae

The genera of the Megaspilidae are difficult to distinguish and *Conostigmus* and *Dendrocerus* have never been adequately delimited. The following key includes an attempt to produce a genuine disjunction for the two genera. The couplet separating females of *Conostigmus* and *Dendrocerus* is long and complex but nevertheless will not adequately distinguish *D. spissicornis* and *C. fasciatipennis,* which have therefore been keyed separately. *Conostigmus fasciatipennis* has many characters typical of *Dendrocerus* species; conversely, *D. punctipes* has several characters normally found in *Conostigmus* species.

Key to the British genera of Megaspilidae

1 Disc of forewing sparsely covered with very short pubescence; radial vein short, 0·5–0·8 times as long as breadth of pterostigma; propodeal spiracle large and conspicuous; hypopygium of female with distinct tuft of upright hairs; interantennal carina incomplete; wings hyaline; macropterous . . . . ***TRICHOSTERESIS*** Förster
(Monotypic: *T. glabra* (Boheman), a parasite of Diptera: Syrphidae)

– Forewing with normal pubescence (except *Dendrocerus punctipes,* which has inter-antennal carina complete and dark area on forewing); radial vein long, at least as long as breadth of pterostigma; propodeal spiracle not large or conspicuous; hypopygium without distinct tuft of upright hairs; macropterous or brachypterous 2

2 Propodeum always with distinctive median double-toothed lamellate projection (Figs 2, 3). Precoxal sulcus strongly developed, foveolate and curved (Fig. 4). Disc of scutellum always conspicuously bordered laterally and apically by strong foveae (Fig. 2). Head sculpture and ocular suture strongly foveolate. Antenna long and broad, AIII at least 4 times longer than broad, AIII of females about twice (1·7–2·1) as long as AIV, AIV of males as long as scape. Interantennal carina without sharp median projection. Macropterous . . . . .
(A rarely collected genus) ***MEGASPILUS*** Westwood

– Propodeum without median double-toothed lamellate projection, often without any projection, or with median fovea, keel, small spine or double tooth. Precoxal sulcus absent, or if present then weakly developed and virtually straight. Disc of scutellum only rarely bordered laterally and apically by strong foveae. Head sculpture usually alutaceous, ocular suture normally without strong foveae. If antennal segments are long they are usually thin, only occasionally is AIII 4 times longer than broad, AIII of females normally less than twice as long as AIV, AIV of males usually shorter than scape. Interantennal carina sometimes with small sharp median projection (Figs 6, 12). Macropterous or brachypterous 3

3 Entire breadth of gaster covered anteriorly by strigose sculpture radiating from gastral collar and nearly reaching gastrocoeli (Fig. 19); head rugose; ocellar triangle with broad base; gastral collar broad and very short . . . ***DENDROCERUS*** (part, ***D. spissicornis***) (p. 292)

– Area of sculpture at anterior of gaster shaped and sculptured differently; if head rugose then ocellar triangle has short base or gastral collar is narrower or longer 4

4 Gastral collar very short and broad (Fig. 18); hairs on costal vein long, up to 0·1 mm (Fig. 39) (these hairs can be lost); ocellar triangle short with a broad base; notaulices complete and sharply angled outwards anteriorly; basal flagellar segments of male virtually cylindrical; large brown area under pterostigma in female, present but less distinct in male; frontal dent absent; disc of forewing with normal pubescence; preoccipital crescent not reaching eyes or ocelli; interantennal carina complete . . ***CONOSTIGMUS*** Dahlbom (part, ***C. fasciatipennis*** Kieffer)

– Gastral collar long (Fig. 20), or if short then hairs on costal vein much shorter, or ocellar triangle long with short base, or notaulices posteriorly absent (Fig. 15) or slightly smoothly angled, or basal flagellar segments of male clearly asymmetrical (Figs 30–32, 47–53), or forewing hyaline, or frontal dent present (Fig. 8), or disc of forewing with reduced pubescence, or preoccipital crescent reaching eyes or ocelli, or interantennal carina incomplete or absent 5

5 Males (AII globular, as in Figs 51–55) 6

– Females (AII elongate, as in Figs 56–63) 7

6 Basal flagellar segments clearly asymmetrical (Figs 30, 47, 49), often strongly serrate (Figs 48, 50–53) or with long projections (Figs 31, 32). If only slightly asymmetrical then mesepisternum smooth and pterostigma at least twice as long as broad (Fig. 38), or parameres exposed, large and distinctively angled (Fig. 29). Ocellar triangle always with broad base (e.g. Fig. 7); eye pubescence short; notaulices sharply angled towards anterior corners of mesonotum (Figs 14, 17) or absent posteriorly (Fig. 15) . . . . ***DENDROCERUS*** (part) (p. 259)

– AII flagellar segments virtually cylindrical; ocellar triangle usually with short base (Figs 5, 6); eye pubescence often long and conspicuous; notaulices complete and usually only slightly smoothly angled towards anterior corners of mesonotum . . . ***CONOSTIGMUS*** Dahlbom (part)

7 Ocellar triangle short with broad base (except *D. punctipes,* which lacks forewing fringe), often almost linear (Fig. 7). Notaulices sometimes posteriorly absent (Fig. 15), always sharply angled outwards anteriorly (when viewed from directly above) (Figs 14–17). Eye pubescence short and inconspicuous, pubescence of upper face short, or if long then ocellar triangle linear. Interantennal carina without projection, frons behind this carina flat or slightly raised with depression inwards from each torulus. Frontal dent small except in *D. pupparum* (Fig. 8). Head alutaceous, without clear frontal line or sculptured ocular suture. Occipital carina weak. Scutellum usually with raised central area, or if not raised then ocellar triangle broad. Raised area of scutellum without margin of sculpture. Mesonotum usually quadrate (Figs 14–17). Head often clearly transverse (Fig. 7). Fresh specimens are brown to black, or if lighter then notaulices incomplete, or wing pubescence strongly reduced, or brachypterous with AIII elongate (Fig. 58). Brachypterous forms are exceptionally rare . ***DENDROCERUS*** (part) (p. 259)

– Ocellar triangle usually long with short base (Figs 5, 6) and forewing fringe present. Notaulices complete and usually only slightly, smoothly angled outwards anteriorly (when viewed from directly above) (Fig. 13). Eye pubescence often long or dense and conspicuous, pubescence of face frequently long. Interantennal carina often with a small sharp median projection (Fig. 6), frons behind this carina frequently distinctly concave (Fig. 6). Frontal dent often strongly developed. Head and ocular suture sometimes strongly sculptured and foveolate frontal line occasionally present. Occipital carina sometimes projecting and foveolate. Scutellum often flat, sometimes with margin of foveolate sculpture. Mesonotum often obviously narrowed anteriorly (Fig. 13). Head frequently globular or rounded (Fig. 6). Body colour often light brown. Frequently brachypterous . . . . ***CONOSTIGMUS*** Dahlbom (part)

DENDROCERUS Ratzeburg

Dendrocerus Ratzeburg, 1852: 180–181. Type-species: *Dendrocerus lichtensteinii* Ratzeburg [= *Ceraphron halidayi* Curtis], by monotypy.

Lygocerus Foerster, 1856: 97. Type-species: *Ceraphron ramicornis* Boheman, by subsequent designation (Ashmead, 1893: 107).

Macrostigma Rondani, 1877: 184. Type-species: *Macrostigma aphidum* Rondani, by monotypy. [Synonymized by Dessart, 1965*a*: 157.]

Atritomus Foerster, 1878: 56. Type-species: *Atritomus coccophagus* Foerster [= *Ceraphron laevis* Ratzeburg], by monotypy. [Homonym of *Atritomus* Reitter, 1877: 384.]

Prodendrocerus Kieffer, 1907: 11. Type-species: *Lygocerus ratzeburgi* Ashmead [= *Ceraphron ramicornis* Boheman], by subsequent designation (Muesebeck & Walkley, 1956: 389). [Synonymized by Dessart, 1966: 5.]

Atritomellus Kieffer, 1914: 141. [Replacement name for *Atritomus* Foerster.] [Synonymized by Hellén, 1966: 9.]

Neolygocerus Ishii, 1951: 16. Type-species: *Neolygocerus koyamai* Ishii, by monotypy. [Synonymized by Dessart, 1966: 11.]

Basoko Risbec, 1958: 111. Type-species: *Basoko africana* Risbec, by monotypy. **Syn. n.**

Antenna eleven-segmented in both sexes (except single fossil female of *D. dubitatus* Brues, which has ten segments). In females scape long, often longer than combined length of next three segments. Pedicel

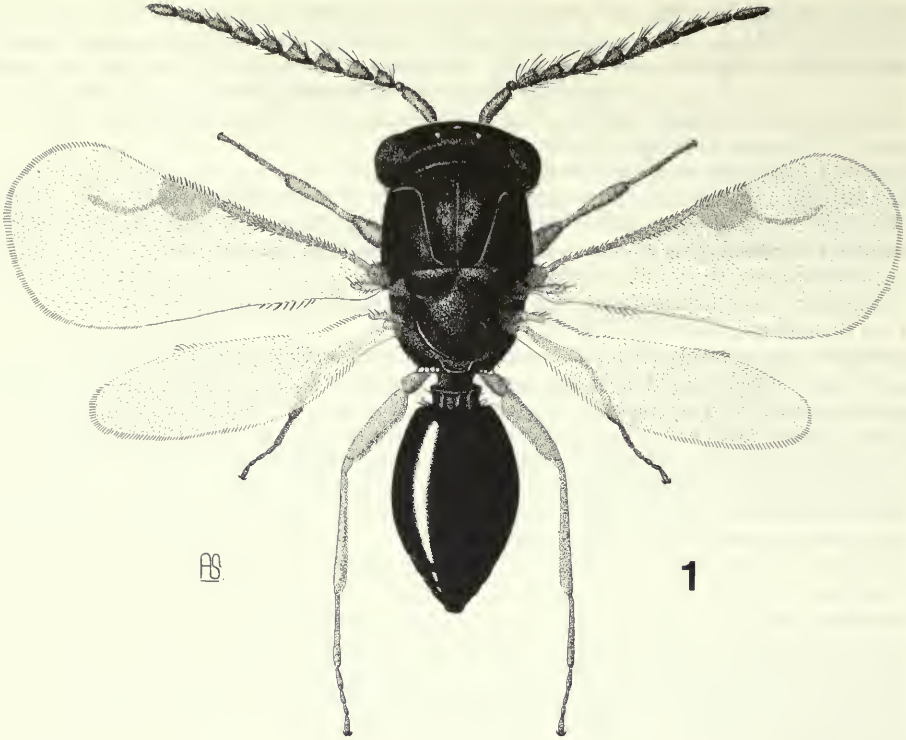


Fig. 1 *Dendrocerus carpenteri* (Curtis), male.

elongate (Figs 56–63), flagellar segments cylindrical. In males scape shorter and stout, usually shorter than combined length of next three segments. Pedicel small and almost globular (Figs 51–55). Basal flagellar segments of males never completely radially symmetrical, varying from almost cylindrical in *D. bifoveatus* (Fig. 55) to serrate in many species (Figs 50–52), strongly serrate in *D. serricornis* (Fig. 53) and ramose in *D. ramicornis* (Fig. 31); asymmetry progressively decreases towards distal segments. Pubescence of flagellum in males often longer than breadth of segment, pubescence in females shorter. Antennae alutaceous or papillate, inserted low on face close to clypeus.

Head lightly sculptured (except *D. spissicornis,* in which it is rugose); pubescence usually very short, eye pubescence short and inconspicuous; generally flat and transverse; usually black or dark brown. Mandibles bidentate. Toruli not strongly extended. Interantennal carina absent or distinctly developed, if present often with slight central hump. (Some species of *Conostigmus* have short sharp medial projection between toruli (Fig. 6) but this does not occur in *Dendrocerus.*) Frons behind interantennal carina flat, or slightly raised with depression inwards from each torulus, without large concave area. Except in *D. pupparum* (Fig. 8), frontal dent absent or present but small. Vertex slightly convex, or biconvex with slight longitudinal median depression but with no clear frontal line. Ocular suture not strongly sculptured. Ocelli present in both sexes. Ocellar triangle short with broad base (e.g. Fig. 7). Anterior ocellus situated just in front of postocellar line. Preoccipital crescent absent, or strongly developed and nearly reaching eyes and ocelli, sharply angled away from vertex. Occipital carina weak.

Side of pronotum with Y-shaped furrow, posterior arm of furrow sometimes faint. Mesonotum usually quadrate (Figs 14, 16, 17), not obviously narrowed anteriorly. Median furrow present. Notaulices sometimes absent posteriorly (Fig. 15) but always present anteriorly, sharply angled outwards (when viewed from directly above) towards anterior corners of mesonotum. In *D. spissicornis* notaulices not quite so sharply angled. Secondary furrows often present (Fig. 14). Scutellum generally convex with raised central area, only rarely with sculpture on margin of raised area. Precoxal sulcus absent. Metanotum reduced. Propodeum often with median fovea. Propodeal spiracle normal. Tibiae of all legs with two spines. Large spine of anterior leg forked at its apex. Claws simple. Brachypterous forms are exceptionally rare. Forewing with large pterostigma (Figs 33–36, 38–46). Radial vein longer than pterostigma (except in two non-British species).

Hindwing with three hamuli, proximal one almost straight, others strongly curved. Anal lobe present on hindwing in *D. ramicornis* (Fig. 37). Wings fully pubescent with fringe except in *D. punctipes*.

Large tergite of gaster with crenulate collar (Fig. 10), clearly with neck, except in *D. spissicornis* which has short broad collar (Fig. 19). Rest of gaster alutaceous or smooth. Gastrocoeli often visible. Hypopygium without distinct tuft of upright hairs. Genitalia with lamina volsellaris fused for greater part along its boundary with paramere.

FUNCTIONAL MORPHOLOGY OF MALE ANTENNAE. The most notable character of *Dendrocerus* males is the lateral extension of the basal flagellar segments. This character reaches its greatest development in the branches of *D. ramicornis* (Fig. 31) and *D. halidayi* (Fig. 32). It is likely that this is a device to increase the olfactory efficiency of the male, probably in its response to sexual attractants liberated by the female. Kaissling (1971: 351) has shown that the efficiency of an antenna as an odour filter can be defined by three terms: the outline area, the adsorption quotient and the effective fraction of adsorption. All these functions are mainly dependent upon the external geometry of the antenna. The most sensitive olfactory apparatus could be expressed as an odour filter with an extended outline area and a good subdivision of form. The antennae of male Saturniidae (Lepidoptera) approach most closely to this ideal.

Subgenera

After clarifying the generic position of *Dendrocerus,* Dessart (1972*a*: 26) retained some of the generic synonyms as subgenera; subgenus *Dendrocerus* for males with branched antenna, subgenus *Atritomellus* for species with the notaulices absent posteriorly, subgenus *Neolygocerus* for a Japanese species with a specialized scutellum, and subgenus *Macrostigma* for the remaining species.

The use of these subgenera is neither significant nor helpful. The separation of subgenus *Dendrocerus* applies only to males. The male of *D. (Neolygocerus) koyamai* (Ishii) has branched antennae like those found in subgenus *Dendrocerus,* and *D. (Dendrocerus) halidayi* often has the notaulices absent posteriorly as in the species of subgenus *Atritomellus*. The two European species of subgenus *Dendrocerus* have very little in common in either morphology or biology. *Atritomellus* is easily split into two groups on morphology, and the dumping of the bulk of the genus under *Macrostigma* has no advantage. For the above reasons these subgenera are listed as generic synonyms and omitted from further consideration in this paper.

Synonymic list of British species

(* = new to the British list)

aphidum (Rondani, 1877)
  rufipes (Thomson, 1858) (junior homonym) **syn. n.**
  aphidorum (Rondani, 1874) nomen nudum
  koebelei (Ashmead, 1904) **syn. n.**
  subquadratus (Kieffer, 1907) **syn. n.**
  fusciventris (Kieffer, 1907) **syn. n.**
  frenalis (Kieffer, 1907) **syn. n.**
  breadalbimensis (Kieffer, 1907) **syn. n.**
  bicolor (Kieffer, 1907) **syn. n.**
  fuscipennis (Kieffer, 1907)
  neglectus (Kieffer, 1907)
  lundensis Dessart, 1966 **syn. n.**

bifoveatus (Kieffer, 1907)
  sordidipes (Kieffer, 1907)

carpenteri (Curtis, 1829)
  crispus (Curtis, 1829) nomen nudum
  elegans (Curtis, 1829) nomen nudum
  hyalinatus (Thomson, 1858)

niger (Howard, 1890)
proximus (Kieffer, 1907)
punctatipennis (Kieffer, 1907) **syn. n.**
rufiventris (Kieffer, 1907) (junior homonym)
campestris (Kieffer, 1907)
aphidivorus (Kieffer, 1907)
testaceimanus (Kieffer, 1907)
aphidum (Kieffer, 1907) (junior homonym)
giraudi (Kieffer, 1907)
cameroni (Kieffer, 1907)
thomsoni (Kieffer, 1907)
inquilinus (Kieffer, 1917)
ambianus (Dessart, 1965)
britannicus Dessart, 1966
tischbeini Dessart, 1966

dubiosus (Kieffer, 1907) **sp. rev.**
longicornis (Thomson, 1858) (junior homonym)
pallipes (Kirchner, 1867) nomen nudum
flavipes (Kieffer, 1907) (junior homonym) **syn. n.**
claripennis (Kieffer, 1907) **syn. n.**
rectangularis (Kieffer, 1907) **syn. n.**
alpestris (Kieffer, 1907) **syn. n.**
navaensis Dessart, 1966 **syn. n.**
flavus (Hellén, 1966) **syn. n.**

******flavipes*** Kieffer, 1907
fuscipes Kieffer, 1907

halidayi (Curtis, 1829)
lichtensteini Ratzeburg, 1852
damicornis (Foerster, 1856) nomen nudum
callicerus (Thomson, 1858)

******laevis*** (Ratzeburg, 1852)
frontalis (Thomson, 1858)
coccophagus (Foerster, 1878)
smirnoffi (Ghesquière, 1960)
applanatus Dessart, 1972 **syn. n.**

******laticeps*** (Hedicke, 1929)

******liebscheri*** Dessart, 1972
tenuicornis (Thomson, 1858) (junior homonym)

******punctipes*** (Boheman, 1832)
parvulus (Wollaston, 1858)

pupparum (Boheman, 1832)
ancyloneurus (Ratzeburg, 1844)
syrphidarum (Kieffer, 1907)

ramicornis (Boheman, 1832)
glabriculus (Thomson, 1858)
japonicus (Ashmead, 1904)
ratzeburgi (Ashmead, 1904)

serricornis (Boheman, 1832)
piceus (Ratzeburg, 1852)
lapponicus (Thomson, 1858)
semiramosus (Kieffer, 1907) **syn. n.**
subramosus (Kieffer, 1907)
zetterstedti (Ghesquière, 1960)

******spissicornis*** (Hellén, 1966)

Key to British species

The recognition of *D. liebscheri* and the separation of *D. aphidum* and *D. dubiosus* is difficult and should be based on series of both males and females. The male of *D. punctipes* is not known; it may well have the forewing pubescence reduced as in the female. An explanation of AI, L/B etc. is given on p. 257.

1 Males (AII globular, as in Figs 51–55) 2

– Females (AII elongate, as in Figs 56–63) 14

2 AIII to AVI each bearing long process always considerably longer than the segment which bears it (Figs 31, 32) 3

– Antenna without long processes; any projection present always equal to or shorter than segment which bears it (Figs 30, 47–55) 4

3 AVII longer than other antennal segments, longer than process it carries (Fig. 32); raised area of scutellum long and narrow, 1·5–2·0 times longer than broad. Hindwing without anal lobe; pterostigma semioval (Fig. 45); body colour brown . . . . . . ***halidayi*** (p. 279)

– AVIII longer than other antennal segments; AVII shorter than process it carries (Fig. 31); raised area of scutellum broad, 1·1–1·3 times longer than broad. Hindwing with small anal lobe (Fig. 37); pterostigma semicircular (Fig. 41); body colour black . . . . . ***ramicornis*** (p. 288)

4 Notaulices incomplete, fading out anteriorly just after bend (Fig. 15) 5

– Notaulices complete, reaching posterior margin of mesonotum (Figs 14, 16, 17) 7

5 AIII approximately same length as scape (Fig. 30); flagellum densely pubescent; proximal flagellar segments strongly papillate; flagellar pubescence short, shorter than maximum breadth of flagellar segments; mesonotum and scutellum relatively elongate (i.e. L/B of mesonotum 0·7–0·8 . . . . ***flavipes*** (p. 278)

– AIII clearly shorter than scape (Figs 47, 48); flagellum sparsely pubescent; proximal flagellar segments at most with only a few papillae; flagellar pubescence long, at least as long as maximum breadth of flagellar segments; mesonotum and scutellum usually broad, only elongate in small specimens (i.e. L/B of mesonotum 0·4–0·7) 6

6 Flagellar segments short (Fig. 48) (e.g. L/B for AIII 1·5–2·5); scape short, about equal to length of eye; preoccipital crescent normally strongly developed, close to margin of eye (Fig. 25); scape without distinct light-coloured basal ring, usually completely dark (considerable light coloration occasionally present but vaguely delimited) . . . . . . ***laevis*** (p. 281)

– Flagellar segments elongate (Fig. 47) (e.g. L/B for AIII 2·4–3·0); scape often long, always longer than length of eye; preoccipital crescent weakly developed, not reaching margin of eye (Fig. 26); scape nearly always with distinct light-coloured basal ring, never completely dark, often with sharply defined longitudinal light-coloured stripe ventrally . . . . . ***laticeps*** (p. 283)

7 Entire breadth of large gastral tergite covered by strigose sculpture, radiating from gastral collar and nearly reaching to gastrocoeli (Fig. 19); apex of scutellum with transverse carina; propodeum with large bilobed transverse keel (Fig. 19); sculpture coarse, mostly rugose . . ***spissicornis*** (p. 292)

– Large gastral tergite at most with short, narrow area of carinae not covering its entire breadth and not reaching gastrocoeli; apex of scutellum without transverse carina; propodeum without bilobed transverse keel, usually with median fovea 8

8 Antenna strongly serrate (Figs 51–53) (L/B for AIII 2·0 or less). Interantennal carina absent or indistinct, if weakly present then L/B for AIV approximately 1·0 (Fig. 53). Forewing always clear. Pterostigma approximately semicircular and radius deeply angled (Figs 40, 42, 43) . 9

– Antenna almost cylindrical (Figs 54, 55) or only moderately serrate (Figs 49, 50) (L/B for AIII usually greater than 2·0, if less then interantennal carina present and forewing with area of brown coloration). Interantennal carina often present and forewing often with brown area. Pterostigma semioval, radius shallowly angled or evenly curved (Figs 33, 38, 44, 46) . 11

9 Basal flagellar segments very strongly serrate (Fig. 53), AIV as long as broad (L/B 0·9–1·2). Preoccipital crescent very strongly developed, reaching eyes. Longest hairs on AVIII at least as long and usually much longer than maximum length of AIX. Thorax and gaster often long and narrow (L/B for thorax 1·4–1·8). Anterior corners of mesonotum often strongly curved downwards and rounded . . . . ***serricornis*** (p. 290)

– Basal flagellar segments less strongly serrate (Figs 51, 52), AIV longer than broad (L/B 1·4 or more). Preoccipital crescent well developed but not quite reaching eyes. Longest hairs on AVIII not quite as long as maximum length of AIX. Thorax and gaster always broad (L/B for thorax 1·5 or less). Anterior corners of mesonotum never strongly curved downwards . . . 10

10 Notaulices strongly convergent posteriorly, meeting or almost meeting median furrow at scutal suture (Fig. 17). Parameres (viewed laterally in situ) expanded apically and broadly truncate

(Fig. 27). Pterostigma (Fig. 42) slightly less semicircular, radius (Fig. 42) slightly less deeply angled than in following species. Gaster often narrow, scutellum narrow and strongly raised. A rare species hyperparasitic on lachnid aphids on conifers . . . . . ***liebscheri*** (p. 285)

– Notaulices only slightly convergent, not meeting median furrow (Fig. 14), or if they meet or almost meet median furrow then they converge in curve (Fig. 16). Parameres (viewed laterally in situ) narrow and apically rounded (Fig. 28). Pterostigma (Fig. 40) (without leading edge curled over) approximately semicircular, radius (Fig. 40) deeply angled. Gaster usually broad, scutellum broad and not so high. An extremely common and widespread species on a wide range of aphids and plants . . . . ***carpenteri*** (p. 270)

11 Pterostigma distinctly long and narrow (Fig. 38), more than 2·1 times longer than broad. Mesepisternum almost totally smooth and shining. Flagellar segments almost cylindrical, only very weakly serrate (Fig. 55), flagellar pubescence longer than breadth of segment . . ***bifoveatus*** (p. 269)

– Pterostigma (without leading edge curled over) relatively broad (Figs 33, 44, 46), less than 2·0 times longer than broad. Mesepisternum clearly with alutaceous sculpture, only rarely is sculpture fine. Basal flagellar segments moderately serrate (Figs 49, 50), or if almost cylindrical (Fig. 54) then flagellar pubescence shorter than breadth of segment 12

12 Apex of parameres strongly upturned or expanded along dorsal edge (Fig. 29). Flagellar pubescence shorter than breadth of segment. Frontal dent strongly developed, circular and slightly linear (Fig. 8). Flagellum from AIV onwards weakly serrate, almost cylindrical (Fig. 54). Radius evenly and shallowly curved (Fig. 44) . . . . . . ***pupparum*** (p. 287)

– Apex of parameres simple, not upturned or expanded. Flagellar pubescence at least as long as breadth of segment. Frontal dent small and shallow, or absent. Flagellum serrate, or if weakly serrate then radius angled (Figs 33, 46) 13

13 Scape short and often stout, 4·0–5·1 times longer than broad, clearly shorter than lateral length of head. Scape often completely black, or with a small amount of yellow at base, sometimes entirely yellow but then scape short and broad, about 4·2 times longer than broad. Legs usually mostly dark, if yellow then scape short and broad (L/B about 4·2) . . . . ***aphidum*** (p. 266)

– Scape longer and thinner, 5·0 or more times as long as broad, nearly equal to lateral length of head. Basal third of scape usually yellow, legs not totally dark, often mostly yellow ***dubiosus*** (p. 276)

14 Thorax long and narrow, 1·5–1·9 times longer than broad, notaulices only clearly present anteriorly, fading out just after bend (Fig. 15). Body colour brown 15

– Thorax broad and stocky, at most 1·4 times as long as broad, or if long and thin then notaulices complete and distinct. Notaulices complete (Fig. 14), or if absent posteriorly then body length 1·5 mm or less, or body colour black (in fresh specimens) 16

15 Forewing with a distinct brown band under pterostigma and radial vein (Fig. 35); gastral collar white or light yellow, strongly contrasting with surrounding body colour; antenna dark brown but often scape lighter basally . . . . ***flavipes*** (p. 278)

– Forewing virtually clear; body colour uniformly brown; antenna entirely brown . ***halidayi*** (p. 279)

16 Notaulices incomplete, present only anteriorly, fading out just after bend (Fig. 15) . . . 17

– Notaulices complete, reaching posterior margin of mesonotum (Fig. 14) 18

17 Flagellar segments elongate (e.g. AIII longer than 0·1 mm, except in teneral specimens) (Fig. 60), first flagellar segment longer than pedicel; preoccipital crescent weakly developed (Fig. 26), clearly separated from margin of eye; scape never completely dark, normally with a distinct light-coloured basal ring (sometimes indistinct in teneral and old specimens); gastral collar long (mid lateral length normally greater than 0·04 mm); total body length very variable (1·3–2·0 mm) . . . . ***laticeps*** (p. 283)

– Flagellar segments short (e.g. AIII less than 0·1 mm) (Fig. 61), first flagellar segment at most as long as pedicel, usually shorter; preoccipital crescent normally well developed (Fig. 25), often close to margin of eye; scape usually completely dark, without distinct light-coloured basal ring, occasionally considerable area is light-coloured but vaguely delimited; gastral collar short (mid lateral length less than 0·04 mm); total body length less than 1·5 mm, often much smaller ***laevis*** (p. 281)

18 Entire breadth of large gastral tergite covered by strigose sculpture radiating from gastral collar and nearly reaching gastrocoeli (Fig. 19); apex of scutellum with transverse carina; propodeum with large bilobed transverse keel (Fig. 19); sculpture coarse, mostly rugose . ***spissicornis*** (p. 292)

– Large gastral tergite at most with short, narrow area of carinae, not covering entire breadth of tergite and not reaching gastrocoeli; apex of scutellum without transverse carina; propodeum without bilobed transverse keel, usually with median fovea 19

19 Pubescence of forewing virtually absent, few fringe hairs present on costal vein and hairs on wing ultra-short. Scutellum completely flat, interantennal carina complete and prominent. Eyes large, occupying most of lateral length of head. Forewings with dark brown mark near pterostigma. Brachypterous specimens are known . . . . ***punctipes*** (p. 286)

– Pubescence of forewing normal, long fringe hairs and hairs on centre of wing conspicuous. Scutellum mostly convex, or if slightly flattened then interantennal carina absent, interrupted, or only weakly developed 20

20 Mesepisternum almost totally smooth and shining. Pterostigma distinctly long and narrow (Fig. 38), more than 2·1 times longer than broad. Legs mostly dark, interantennal carina weak but present, forewing evenly light brown, scape dark . . . . ***bifoveatus*** (p. 269)

– Mesepisternum clearly with alutaceous sculpture, only rarely is sculpture fine. Pterostigma (when flat and without leading edge curled over) relatively broad (Figs 33, 40–44, 46), less than 2·0 times longer than broad; if pterostigma is almost twice as long as broad then legs mostly yellow, or interantennal carina absent, or forewing with conspicuous brown area, or base of scape yellow 21

21 Frontal dent strongly developed, circular and slightly linear (Fig. 8). Forewing with brown area under radius, which is very shallowly curved (Fig. 44). Interantennal carina incomplete (Fig. 8), absent or very indistinct centrally. Scape brown. Body length 1·9–3·2 mm . ***pupparum*** (p. 287)

– Frontal dent small and shallow, or absent. Forewing clear, radius distinctly angled (Figs 40–43), if otherwise then interantennal carina complete and prominent, or scape distinctly yellow at base, or body length less than 1·9 mm 22

22 Forewing with area of brown pigmentation near pterostigma (Fig. 33). Interantennal carina present, usually conspicuous. Body length less than 1·9 mm, body not long and narrow (L/B for thorax 1·5 or less). Pterostigma semioval (Figs 33, 45). Notaulices only moderately convergent, not meeting median furrow. Legs often mostly yellow or yellow-brown . . 23

– Forewing uniformly clear. Interantennal carina absent, or if very weakly developed then body length greater than 2·1 mm, or head (in dorsal view) rounded, anterior corners of mesonotum distinctly rounded and body clearly long and narrow)e.g. L/B for thorax 1·4–1·8). Pterostigma almost semicircular (Figs 40, 41, 43), or if semioval (Fig. 42) then notaulices strongly convergent posteriorly, meeting median furrow at scutal suture (Fig. 17). Legs often mostly dark 24

23 AIII clearly much longer than AII (Fig. 58). Scape 5·7–7·0 times longer than broad, much longer than head. Legs entirely yellow, very rarely basal half of hind coxa dark. Scape yellow basally. (Three brachypterous specimens are known and these have the scape slightly shorter than normal) . . . . ***dubiosus*** (p. 276)

– AIII about equal to or slightly longer than AII (Fig. 59). Scape less than 5·7 times longer than broad, about equal to or shorter than head. Legs always dark on basal half of hind coxa, usually dark on outside of hind femur and sometimes dark elsewhere. Scape usually mostly black but sometimes entirely yellow. (No known brachypterous specimens) . . ***aphidum*** (p. 266)

24 Head (in dorsal view) rounded; anterior corners of mesonotum strongly downcurved and rounded. Body clearly long and narrow (e.g. L/B for thorax 1·4–1·8). Preoccipital crescent strongly developed and virtually reaching eye margin.

Body length 1·4–1·8 mm, pterostigma as in Fig. 43. Parasite of Diptera: Chamaemyiidae on Hemiptera: Adelgidae . . . . ***serricornis*** (p. 290)

– Head clearly transverse, not rounded; anterior corners of mesonotum not obviously downcurved or rounded. Body not notably long and narrow (e.g. L/B for thorax 1·5 or less). Preoccipital crescent present but not reaching eye margin, or if it does then body length 2·1 mm or more 25

25 Body large, 2·1–2·8 mm long; AIII clearly longer than AII (about 1·5 times longer). Interantennal carina present but not prominent. Hindwing with small pronounced anal lobe (Fig. 37). Legs often mostly light brown. Pterostigma distinctively shaped, approximately semicircular (Fig. 41).

Due to large size, head appears to be strongly transverse. Preoccipital crescent usually reaching close to margin of eye. Hyperparasite of Hemiptera: Lachnidae, often on coniferous and deciduous trees . . . . ***ramicornis*** (p. 288)

– Body smaller, only rarely as long as 2·1 mm; AIII approximately as long as AII. Interantennal carina absent. Anal lobe indistinct or absent. Legs mostly dark. Pterostigma roughly semicircular (Fig. 40) or semioval (Fig. 42) 26

26 Scape long (5–7 times longer than broad), longer than lateral length of head. AV to AIX elongate (Fig. 56) (e.g. L/B for AVI 1·6–2·0). Notaulices strongly convergent posteriorly, meeting or

almost meeting median furrow at scutal suture (Fig. 17). Pterostigma (Fig. 42) slightly less semicircular and radius (Fig. 42) slightly less deeply angled than in following species. A rare species hyperparasitic on lachnid aphids on conifers . . . . . . ***liebscheri*** (p. 285)

– Scape shorter (at most 5 times as long as broad), shorter than lateral length of head. AV to AIX not so long (Fig. 57) (e.g. L/B for AVI 1·1–1·6). Notaulices only slightly convergent, not meeting median furrow (Fig. 14), or if they meet or almost meet median furrow then they converge in curve (Fig. 16). Pterostigma (Fig. 40) (without leading edge curled over) approximately semicircular, radius (Fig. 40) deeply angled. An extremely common and widespread species on a wide range of aphids and plants . . . . ***carpenteri*** (p. 270)

Species descriptions

Dendrocerus aphidum (Rondani)

(Figs 33, 50, 59)

Ceraphron rufipes Thomson, 1858: 293. Lectotype ♀, SWEDEN (NR, Stockholm), designated by Dessart (1972*a*: 102) [examined]. [Primary homonym of *Ceraphron rufipes* Nees, 1834: 277.] **Syn. n.**

Macrostigma aphidorum Rondani, 1874: 134. [Nomen nudum.] ['Synonymized' by Dessart, 1965*a*: 157.]

Macrostigma aphidum Rondani, 1877: 184–185, pl. 1, figs 34, 36. Lectotype ♂, ITALY (MZU, Florence), designated by Dessart (1965*a*: 158) [examined].

Lygocerus koebelei Ashmead, 1904: 70. Lectotype ♂, JAPAN (USNM, Washington), designated by Masner & Muesebeck (1968: 112) [examined]. **Syn. n.**

Lygocerus subquadratus Kieffer, 1907: 42. Lectotype ♂, GREAT BRITAIN (BMNH), designated by Masner (1965: 21) [examined]. **Syn. n.**

Lygocerus fusciventris Kieffer, 1907: 47. Lectotype ♂, GREAT BRITAIN (BMNH), designated by Masner (1965: 20) [examined]. **Syn. n.**

Lygocerus frenalis Kieffer, 1907: 47–48. Lectotype ♂, GREAT BRITAIN (BMNH), designated by Masner (1965: 20) [examined]. **Syn. n.**

Lygocerus breadalbimensis Kieffer, 1907: 53–54. Lectotype ♀, GREAT BRITAIN (BMNH), designated by Masner (1965: 20) [examined]. **Syn. n.**

Lygocerus bicolor Kieffer, 1907: 62. Lectotype ♀, GREAT BRITAIN (BMNH), designated by Masner (1965: 20) [examined]. **Syn. n.**

Lygocerus fuscipennis Kieffer, 1907: 64. Lectotype ♀, ITALY (MCSN, Genoa), designated by Dessart (1972*a*: 59) [examined]. [Synonymized by Dessart, 1972*a*: 52.]

Lygocerus neglectus Kieffer, 1907: 64–65. Syntype(s) ♀, FRANCE: Amiens, August (*Carpentier*) (lost). [Synonymized by Dessart 1972*a*: 52.]

Lygocerus aphidum (Rondani) Dessart, 1965*a*: 157.

Dendrocerus aphidum (Rondani) Dessart, 1966: 12.

Dendrocerus lundensis Dessart, 1966: 12. [Replacement name for *Ceraphron rufipes* Thomson, 1858.] **Syn. n.**

FEMALE. Scape length variable (L/B less than 5·7), but longer than AII, AIII and AIV together, about equal to or less than length of head. Scape usually black with a little yellow at base, sometimes entirely yellow. AII approximately equal to length of AIII, often slightly shorter than AIII. Flagellar segments flat ventrally. Apex of AII slightly lighter than rest of flagellum which is black or brown. Antenna weakly papillate, pubescence short, quite dense.

Head alutaceous; pubescence short, except on clypeus, black; mandibles brown with red teeth, palps colourless. Head somewhat rounded but still transverse. Frons rather flat but with central swelling and small depression behind each torulus. Frontal dent absent, or small and shallow. Depression in front of median ocellus small, depressions by lateral ocelli shallow. Interantennal carina with central hump. Toruli not prominent. Ocellar triangle broad and short, Lateral Ocelli linked posteriorly by faint groove. Vertical furrow absent or very faint. Preoccipital crescent small, not reaching eyes and only rarely near ocelli.

Thorax black or very dark brown, alutaceous, with short pubescence. Notaulices complete, angled outwards but not as acutely angled as in most *Dendrocerus* species. Secondary furrows not always visible. Axillae only downcurved near outer edge. Scutellum distinctly arched but central area occasionally rather flat. Metanotal furrow strongly foveolate. Pleural sulcus foveolate. Propodeum with distinct median fovea. Leg colour variable but basal half of hind coxa always dark, usually outside of hind femur and often rest of legs dark. Tibiae and tarsi often mostly yellow. Forewing with brown area under pterostigma and often dark in proximal region so that basal veins are indicated as clear lines. Pterostigma semiovoid, 1·6–1·9 times longer than broad. Radius about 1·3 times longer than pterostigma. Wing pubescence normal.

Gastral collar long with many carinae, of which three are usually prominent. Gaster mostly smooth. Gastrocoeli visible as light brown areas. Basal half of gaster sometimes lighter in colour than posterior half.

MALE. As for female except scape short and often stout, at most 5·1 times longer than broad, clearly shorter than lateral length of head; longer than AII and AIII together. Scape often completely black or with small area of yellow at base, if entirely yellow, then it is also short and broad, about 4·2 times longer than broad. AIII longer and more slender than AIV (Fig. 50). Basal flagellar segments serrate (Fig. 50), their pubescence longer than breadth of segment.

REMARKS. The study of many specimens has shown that *D. aphidum* is very variable in size and coloration. I have been unable to find any constant method of separating the usually larger and lighter specimens (*breadalbimensis*) from the usually smaller and darker specimens of *D. aphidum.*

Previously *D. aphidum* and *D. breadalbimensis* were distinguished by leg, forewing and scape coloration; length of certain antennal segments; degree of development of interantennal carina; and differences in the male genitalia. Leg coloration varies to such an extent that it is an unreliable character at the species level. Forewing colour provides some discrimination but several specimens with quite dark wings (showing basal veins) are otherwise typical examples of *D. breadalbimensis.* The differences in length of the scape and flagellar segments reflect size variation. Several series of very dark and very small specimens of *D. aphidum* from Iceland may have unduly influenced previous concepts of this species. The scape coloration does not appear to give a reliable distinction and there are no interantennal carina differences. The main separating character was the male genitalia. In *D. aphidum* the volsella plates appeared to have a distinctive sinuous, angular termination and a non-apical hair, whereas in *D. breadalbimensis* (and *D. bicolor*) they were rounded with an apical hair. The 'sinuate form' of genitalia is in fact a slightly lateral view of the 'round form' of genitalia. The pubescence changes its position relative to the apex in the same way. In view of these considerations I am regarding all these specimens as conspecific.

The lectotypes of *Lygocerus bicolor, L. fusciventris, L. frenalis* and *L. subquadratus* are all large specimens of *D. aphidum* (= *L. breadalbimensis*). (The paralectotype of *L. bicolor* and the lectotype of *L. breadalbimensis* were collected together.) *D. bicolor* auct. nec Kieffer is *D. dubiosus* (see p. 276), the females of this species being easily recognizable by their long AIII; females of *D. aphidum* have AII and AIII about equal in length. The paralectotype of *Conostigmus dubiosus* is a specimen of *D. aphidum* and thus not conspecific with the lectotype of *C. dubiosus*. The lectotype of *Lygocerus koebelei* is a specimen of *D. aphidum;* the paralectotypes are *D. carpenteri and D. serricornis*.

It is not certain that this complex consists of only two species. Apart from the large specimens (*breadalbimensis*) there is a small group of males that I have tentatively placed in *D. aphidum.* These have yellow legs and scape and the latter is very broad and short, but I am not convinced that they are separable from *D. aphidum* on such characters; also they occur with typical specimens of *D. aphidum.*

The species separation detailed above and in the keys is the most practical arrangement possible at present, although it might be improved when reared series of both sexes are obtained and the biology is well known.

After *D. carpenteri, D. aphidum* (as defined above) is one of the most common species of *Dendrocerus.*

BIOLOGY. The following three host records for *D. rufipes* are probably misidentifications of other *Dendrocerus* or *Conostigmus* species. Henriksen (1918: 140) recorded *D. rufipes* from fly pupae. Mani (1941: 27) recorded *D. rufipes* from a chrysopid (Neuroptera) on sugar-cane and Pruthi & Mani (1942:421) gave *Chrysopa virgestes* (Neuroptera) as a host. All other host data indicate that *D. aphidum* (= *rufipes*) is a secondary parasite of aphids. The records for *D. aphidum* are too extensive to register in full; the following are alphabetical lists of hosts and parasites.

Hosts (Aphidoidea): *Acyrthosophon malvae, A. pisum, A.* sp., *Aphis evonymi, A. nasturtii, A. pomi, A.* sp., *Brachycaudus persicae, Cavariellia aegopodii, Clethrobius comes, Diuraphis frequens, D. noxius, Eucallipterus tiliae, Hyalopterus pruni, Liosomaphis berberidis, Macrosiphoniella usquertensis, Metopolophium dirhodum, M.* sp., *Microlophium carnosum, M.* sp., *Myzus persicae, Paraschizaphis scirpi, Rhopalosiphum nymphaeae, Schizaphis graminum, Sipha maydis, Sitobion avenae, S. fragariae, Uroleucon cirsii, U.* sp.

Primary parasites (Aphidiidae): *Aphidius ervi, A. picipes, A. platensis, A. sonchi, A. uzbekistanicus, A.* sp., *Binodoxys acalephae, Diaeretiella rapae, Ephedrus persicae, E. plagiator, E.* sp., *Praon abjectum, P. necans, P. volucre, P.* sp., *Trioxys betulae.*

The records of hosts and parasites listed above are taken from material examined and from the following references: Boness (1958: 322); Dessart (1972*a*: 58; 1975: 267–269); Ivanova-Kazas (1955: 151); Kieffer (1907 63); Kryger & Schmiedeknecht (1938: 76); Malaquin & Moitié (1914: 804); Meyer (1929: 234–244); Rondani (1877: 184) and Starý (1977: 2).

The host information for *D. aphidum* includes records that are typical elements of certain faunistic complexes. The record *Aphis* sp./*Binodoxys acalephae*/*Caltha palustris* along with several other records indicate that *D. aphidum* is part of the Eurasian steppe faunistic complex. The record *Clethrobius comes*/*Trioxys betulae*/*Alnus incana* represents the Holarctic forest tundra faunistic complex, and *Rhopalosiphum nymphaeae*/*Praon necans*/*Sagittaria* sp. is typical of the Boreal Europe faunistic complex. There are several records from grass, one from the complex of parasites on apple, and a few from deciduous forest. The aphids are Chaitophoridae (1 record), Callaphididae (2 records) and Aphididae; over half of the last family are Macrosiphinae, *Acyrthosiphon* (11 records) and *Sitobion* (8 records) being the most frequently recorded genera. The Callaphididae are a deciduous forest group. The Aphidiidae listed include most of the common genera, *Aphidius* and *Praon* being the most frequently recorded. The recorded plants are shrubs, herbs, a few trees, and many crop and grassland plants, and include both Monocotyledons and Dicotyledons. Several plants are associated with wet habitats, e.g. *Sagittaria, Typha* and *Angelica.* Thus *D. aphidum* is associated with cooler conditions, wet places, grass and deciduous trees and is commonly found on crops. It has been collected from March to November, its numbers reaching a peak in June and July.

MATERIAL EXAMINED

Ceraphron rufipes Thomson, lectotype ♀, **Sweden:** 'Ld. [Lund] 9/57' (NR, Stockholm). *Macrostigma aphidum* Rondani, lectotype ♂, **Italy:** (locality unknown) (MZU, Florence). *Lygocerus koebelei* Ashmead, lectotype ♂, **Japan:** Atami (*Koebele*) (USNM, Washington). *Lygocerus subquadratus* Kieffer, lectotype ♂, **Great Britain:** [Scotland, Central] Clober (*Cameron*). *Lygocerus fusciventris* Kieffer, lectotype ♂, **Great Britain:** [Scotland, Central] Mugdock (*Cameron*). *Lygocerus frenalis* Kieffer, lectotype ♂, **Great Britain:** [Scotland, Strathclyde] Lock Libo (*Cameron*). *Lygocerus breadalbimensis* Kieffer, lectotype ♀, **Great Britain:** [Scotland, Tayside] 'Ben Lawers, along with 1' [1 = paralectotype of *bicolor*]] (*Cameron*). *Lygocerus bicolor* Kieffer, lectotype ♀, **Great Britain:** [Scotland, Dumfries and Galloway] New Galloway (*Cameron*). *Lygocerus fuscipennis* Kieffer, lectotype ♀, **Italy:** Giglio I., iv. 1902 (*Doria*) (MCSN, Genoa).

239 ♂, 147 ♀. **Algeria:** Esbarres; Oran. **Canary Is.:** Tenerife. **Egypt:** Siwa. **France:** Dordogne, Mouleydier; Pyrénées-Orientales. **Germany (East):** Harz Mts, Brocken dist.; Hinnundviedust, Altvater. **Great Britain.** Bedfordshire: Dunstable Downs, Eaton Bray, Steppingly; Berkshire: nr Streatly, Lambourn Down, Silwood Park, Thatcham Moor, nr Theale, Wytham; Buckinghamshire: Burnham Beeches, Farnham; Cambridgeshire: Wicken Fen; Cheshire; Cumbria: Wray Castle; Devon: Bovey Heathfield, Lustleigh, Torquay dist., Woolacombe; Dorset: nr Wareham; Dyfed: Llangranog; Essex: Hornchurch; Glamorgan; Gloucestershire: Gloucester, Staunton; Greater London: Highgate, Norwood; Gwynedd: Llanddona; Hampshire: Farley, New Forest, Southampton; Hereford and Worcester: Fawnhope; Hertfordshire: Rothamsted, Royston; Highland; Isles of Scilly; Kent: Barnehurst, Eynsford; Lancashire: Ainsdale; Norfolk: Norwich, Foulden; Northamptonshire: Spratton; North Yorkshire: Malham Tarn; Oxfordshire: Headington, Oxford, Mapledurham, Summertown; Salop; Caer Caradoc; Somerset: Winsford; Suffolk: Minnesmere, Santon Downham, Wangford; Surrey: Ashtead, Coulsdon, East Sheen; Effingham, Esher Common, Horsley, Kew, Oxshott, Richmond; Tayside: Ben Lawers (paralectotype of *Lygocerus bicolor* Kieffer); Western Isles: Lewis, Stornoway Castle; [?] Thornhill (paralectotype of *Conostigmus dubiosus* Kieffer). **Greece:** Kifisia; Mt. Parnis. **Greenland:** Noret, nr Mesters Vig. **Iceland:** Akureyri; Dyrholaey; Eyjafjall, Skogasandur; Seljaland; Vestmannaeyjar. **Ireland:** Co. Dublin, Bohernabreena; Leitrim; Sligo, Trawallua; Wicklow, Blessington, Tonelagee Mt. **Israel:** Bet Dagen. **Italy:** Cortina, D'Ampezzo. **Morocco:** Beni Mellal. **Lebanon:** Beirut. **Netherlands:** Helmond; Tiel; Urk; Wageningen. **Portugal:** Lisbon; **Spain:** Marbella, Malaga. **Sweden:** Jmt Fors; Skåne, Lund; Skåne, Stensoffa; Sulnasker. **Yugoslavia:** Istria.

FURTHER DISTRIBUTION. Austria (Hellén, 1966: 13); Belgium (Dessart, 1972*a*: 59); Czechoslovakia (Starý, 1977: 2); Denmark (Henriksen, 1918: 140); Finland (Hellén, 1966: 13); Norway (Hellén, 1966: 13); U.S.S.R. (Ivanova-Kazas, 1955: 151). Asia: ? India (Mani, 1941: 27). South America: Chile (Dessart, 1975: 268). Australasia: Australia (Dessart, 1975: 267).

Dendrocerus bifoveatus (Kieffer)

(Figs 38, 55)

Lygocerus bifoveatus Kieffer, 1907: 55. Holotype ♀, FRANCE: Amiens, ex *Aphis* on *Cirsium arvense* (*Carpentier*) (lost).
Lygocerus sordidipes Kieffer, 1907: 63. Lectotype ♀, GREAT BRITAIN (BMNH), designated by Masner (1965: 21) [examined]. [Synonymized by Dessart, 1972*a*: 88.]
Dendrocerus bifoveatus (Kieffer) Dessart, 1972*a*: 88.

FEMALE. Scape relatively long, usually longer than AII, AIII and AIV together, nearly as long as head. Flagellum thin, AIII 3–4 times as long as broad. Only AI and usually AXI longer than AIII. Segments AV to AX approximately equal in length, segments AVI to AX about equal in breadth. AII clearly broader than AIII. Pubescence short but slightly longer on the proximal than on distal segments. Ventrally, flagellar segments flat with single central groove. Antenna weakly papillate; dark brown except distal end of AII which is often lighter in colour. Old specimens can fade to light brown.

Head smooth or weakly alutaceous; pubescence short but dense on gena, long on clypeus; dark brown, mandibles brown with red teeth, palps clear brown; transverse but not strongly so, broader than thorax. Eyes variable in size but never large. Frontal dent shallow or absent, depression behind each torulus shallow. Depression in front of median ocellus distinct and sometimes deep. Depressions near lateral ocelli almost absent. Interantennal carina weakly developed, usually almost complete over central area. Ocellar triangle broad, ocelli almost in line. Horizontal groove behind ocelli absent. Preoccipital crescent present but rounded, not limited by ridge, not reaching eyes or ocelli. Vertical furrow indistinct.

Thorax dark brown or black, weakly alutaceous. Pubescence not long except for region of dense hairs on mesepimeron and side of propodeum. Mesonotum slightly narrowed anteriorly. Anterior corners very sharp due to deep impression of notaulices in this region. Notaulices complete, usually sharply angled but can be more smoothly angled in some specimens, not meeting posteriorly. Lateral secondary furrows short; pair of anterior central furrows also present and far more evident on each side of median furrow. Median furrow distinct. Scutellum with raised central area strongly arched. Scutellum up to twice as long as broad. Propodeum weakly rugose or smooth between carinae. Propodeal fovea present, transverse propodeal carina strongly developed. Pronotum alutaceous, only bottom arm of Y-shaped furrow obvious. Mesepisternum almost completely smooth, shiny and only with peripheral pubescence; strong furrow present from near top of anterior mesepisternal boundary to episternal scrobe. Legs mostly dark brown; joints light brown in some specimens.

Forewing slightly and evenly light brown, sometimes lighter in distal region. Fringe long. Pterostigma long and thin (Fig. 38), over twice as long as broad. Radius as long as or little longer than pterostigma and only moderately curved.

Gaster 1·5–1·8 times longer than broad. Gastral collar well developed (but rather short in lectotype of *D. sordidipes*), with tuft of long hairs on each side. When visible gastrocoeli are lighter brown than rest of gaster. Gaster smooth, densely pubescent ventrally, in distal third.

A small species about 1·5 mm long.

MALE. As for female except scape short, over four times longer than broad and longer than AII plus AIII. Flagellar segments weakly serrate, nearly cylindrical (Fig. 55); elongate, AIII three times as long as broad. Only AI and usually AXI longer than AIII.

REMARKS. The holotype of *D. bifoveatus* is lost; it is therefore unfortunate that the name *bifoveatus* was chosen by the first reviser in preference to *sordidipes*, the lectotype of which is extant.

The antennae of males are unusually weakly serrated for a species of *Dendrocerus* but the ocellar triangle and other characters, and the biology, confirm the placement of *bifoveatus* in this genus. The antennae of males, the elongate pterostigma and the smooth mesepisternum distinguish *D. bifoveatus* but it is difficult to assess its affinities.

BIOLOGY. Starý (1977: 2) recorded *D. bifoveatus* from *Paraschizaphis scirpi / Aphidius urticae / Typha angustifolia* and *P. scirpi / Diaeretiella rapae / Typha angustifolia*, from moorland. In the BMNH collection there are seven specimens with host records: two from *Acyrthosiphon malvae* on *Achillea millefolium*, four from *A. auctus* and one from *Rhopalosiphonius calthae*. Kieffer (1907: 55) recorded *D. bifoveatus* from '*Aphis* noir' on *Cirsum arvense*.

Kieffer's black aphid may have been an *Aphis* species of the *fabae* group, viz. *Brachycaudus cardui* (adults black) or *Uroleucon cirsii* (dark red). The *A. malvae* listed above had wandered from its normal host plants (*Potentilla crantzii* or *Geum* sp.). *A. auctus* has a north European coastal distribution, *R. calthae* is specific to *Caltha palustris,* and *Typha angustifolia* grows in shallow water, therefore a wet marsh or moor habitat is indicated for *D. bifoveatus.* This habitat preference explains the large number of records from Iceland (the climatic and soil conditions result in a preponderance of wet moorland habitat). *D. bifoveatus* has been collected mostly in July and August.

MATERIAL EXAMINED

Lygocerus sordidipes, lectotype ♀, **Great Britain:** 'Bonar [= Bonar Bridge, Todcaster, Yorkshire (*Binnie*)], 483' (BMNH).

9 ♂, 11 ♀. **Great Britain.** Cheshire: Rostherne; North Yorkshire: Malham Tarn (*Hincks*) (MM, Manchester); Western Isles: Lewis, L. na Gainmheich. **Iceland:** Akureyri; Hornafjördur, Dynjandi (ZI, Lund); Hornafjördur, Thveit (ZI, Lund); Modruvellir, Eyjabjördur; Vestmannaeyjar, Alfsey (ZI, Lund); Vestmannaeyjar, Sudurey (ZI, Lund).

FURTHER DISTRIBUTION. France (Kieffer, 1907: 55); Czechoslovakia (Starý, 1977: 2); Sweden (Dessart, 1972*a*: 94).

Dendrocerus carpenteri (Curtis)

(Figs 1, 14, 16, 21–24, 28, 40, 51, 57)

Ceraphron carpenteri Curtis, 1829*a*: 249. Syntype(s), GREAT BRITAIN: ex aphids (*Carpenter*) (lost). Neotype ♂, BELGIUM (IRSNB, Brussels), designated by Dessart (1972*a*: 119) [examined].

Ceraphron crispus Curtis, 1829*a*: 249. Nomen nudum.

Ceraphron elegans Curtis, 1829*a*: 249. Nomen nudum.

Megaspilus carpenteri (Curtis) Stephens, 1829: 401.

Calliceras carpenteri (Curtis) Westwood, 1840: 77.

[*Ceraphron fuscipes* Nees; Ratzeburg, 1852: 180. Misidentification.]

Ceraphron hyalinatus Thomson, 1858: 291. Lectotype ♂, SWEDEN (ZI, Lund), designated by Dessart (1972*a*: 119) [examined]. [Synonymized by Dessart, 1970: 143.]

[*Ceraphron stigma* Nees; Thomson, 1858: 290. Misidentification.]

Lygocerus carpenteri (Curtis) Marshall, 1868: 158.

Coryne carpenteri (Curtis) Buckton, 1876: pl. 7.

Megaspilus niger Howard, 1890: 247. Lectotype ♀, U.S.A.: Michigan, Selkirk, vii. 1889 (USNM, Washington), designated by Masner & Muesebeck (1968: 113). [Synonymized by Dessart, 1972*b*: 240.]

Lygocerus carpentieri: Marshall, 1896: 569. [Incorrect subsequent spelling of *carpenteri* Curtis.]

Trichosteresis proxima Kieffer, 1907: 32. Lectotype ♀, GREAT BRITAIN: Bugbroak (*Marshall*) (TM, Budapest), designated by Dessart (1974*b*: 413). [Synonymized by Dessart, 1974*b*: 413.]

Trichosteresis punctatipennis Kieffer, 1907: 33. Holotype ♀, GREAT BRITAIN (BMNH) [examined]. **Syn. n.**

Lygocerus rufiventris Kieffer, 1907: 45. Lectotype ♀, GREAT BRITAIN (BMNH), designated by Masner (1965: 21) [examined]. [Secondary homonym of *Atritomus rufiventris* Ashmead, 1887. [Synonymized by Dessart, 1970: 143.]

Lygocerus campestris Kieffer, 1907: 48. Syntype(s), FRANCE: Amiens (*Carpentier*) (lost). [Synonymized by Dessart, 1972*a*: 107.]

Lygocerus aphidivorus Kieffer, 1907: 49–50. Lectotype ♀, GREAT BRITAIN (BMNH), designated by Masner (1965: 19) [examined]. [Synonymized by Dessart, 1970: 143.]

Lygocerus aphidivorus var. *inconspicuus* Kieffer, 1907: 50. Syntype(s), FRANCE: Amiens (*Carpentier*) (lost). [Synonymized by Dessart, 1972*a*: 107.]

Lygocerus testaceimanus Kieffer, 1907: 51. Syntype(s), FRANCE (? lost). [Synonymized by Dessart, 1970: 143.]

Lygocerus aphidum Kieffer, 1907: 52. Syntype(s), FRANCE: Amiens, ex *Aphis* on *Medicago sativa* (*Carpentier*) (lost). [Secondary homonym of *Macrostigma aphidum* Rondani, 1877.] [Synonymized by Dessart, 1972*a*: 107.]

Lygocerus giraudi Kieffer, 1907: 52–53. Syntype(s), AUSTRIA, FRANCE (lost). [Synonymized by Dessart, 1970: 143.]

Lygocerus cameroni Kieffer, 1907: 56–57. Lectotype ♀, GREAT BRITAIN (BMNH), designated by Masner (1965: 20) [examined]. [Synonymized by Dessart, 1970: 143.]

Lygocerus thomsoni Kieffer, 1907: 57–58. Lectotype ♀, SWEDEN (NR, Stockholm), designated by Dessart (1972*a*: 119) [examined]. [Replacement name for *Ceraphron stigma* Nees; Thomson, 1858: 290.] [Synonymized by Dessart, 1970: 143.]

Lygocerus inquilinus Kieffer, 1917: 349. Holotype ♂, GERMANY (WEST) (NHM, Maastricht) [examined]. [Synonymized by Dessart, 1970: 143.]

Trichosteresis carpenteri (Curtis) Morley, 1929: 55.

Lygocerus ambianus Dessart, 1965*a*: 158. [Replacement name for *Lygocerus aphidum* Kieffer, 1907.] [Synonymized by Dessart, 1972*a*: 107.]

Dendrocerus britannicus Dessart, 1966: 12. [Replacement name for *Lygocerus rufiventris* Kieffer, 1907.] [Synonymized by Dessart, 1970: 143.]

Dendrocerus tischbeini Dessart, 1966: 12. Holotype ♂, GERMANY (EAST) (IP, Eberswalde). [Replacement name for *Ceraphron fuscipes* Nees; Ratzeburg, 1852: 180.] [Synonymized by Dessart, 1972*a*: 107.]

Dendrocerus carpenteri (Curtis) Dessart, 1970: 142.

FEMALE. Scape short but longer than AII, AIII and AIV together. AII and AIII approximately equal in length. Rest of flagellar segments short (L/B about 1·1–1·6), except AXI which is usually twice as long as broad (Fig. 57). Flagellar segments flattened ventrally. Antenna black but distal end of AII sometimes lighter; weakly papillate, with short dense pubescence.

Head alutaceous, with short pubescence except on or near clypeus; black, or brown in faded specimens, mandibles brown with red teeth, palps colourless; transverse, frons broad. Depressions behind toruli large, separated by distinct hump, those near lateral ocelli small, that in front of median ocellus larger, deep and in some specimens prolonged anteriorly as faint short frontal line. Interantennal carina absent. Ocellar triangle broad, the ocelli almost in line. Preoccipital crescent well developed, anteriorly limited by distinct ridge behind ocelli but not reaching eyes. Vertical furrow present.

Thorax alutaceous, black (brown in faded specimens) with short, quite dense pubescence. Mesonotum broad, almost quadrate. Notaulices complete, strongly angled and often only slightly convergent posteriorly. Four secondary furrows often visible. Scutellum broad and raised but flattened centrally. Propodeum medially very short, fovea not strongly developed. Posterior propodeal carina strongly developed, especially laterally. Y-shaped furrow on pronotum deeply impressed. Legs mostly brown-black but anterior tibiae usually lighter, as are articulations.

Wings clear, pterostigma nearly semicircular but distal edge almost straight. Radius strongly curved (Fig. 40), often continuing distally without pigmentation.

Gaster black or brown, mostly smooth. Gastral collar with strong carinae. Gastrocoeli not always visible but when present broad and lighter brown than rest of gaster.

MALE. As for female except scape short, slightly longer than AII and AIII together. Basal flagellar segments ventrally slightly concave; strongly serrate (Fig. 51), becoming less serrate distally, segments X and XI cylindrical. AIII almost twice as long as broad. Antenna brown. Flagellar pubescence long, at least as long as breadth of segment. Preoccipital crescent more developed and transverse than in female, eye slightly more rounded. Parameres rather narrow.

REMARKS. *D. carpenteri* is often found in large numbers and has been recorded from most parts of the world. Starý (1977: 6) found that *D. carpenteri* accounted for 92·6% of the 1865 specimens of *Dendrocerus* he studied. *D. carpenteri* is easily separated from most other species of *Dendrocerus* but *D. liebscheri* is very similar; very small specimens of *D. carpenteri* look like *D. aphidum.* The lectotype of *Lygocerus koebelei* is a specimen of *D. aphidum* but three of the four paralectotypes are faded specimens of *D. carpenteri.* In the Haliday collection there is a labelled specimen of *Ceraphron crispus* (listed by Curtis, 1829*a*: 249 but not described). It is badly damaged (only the antenna, legs and wings are left) but identifiable as a specimen of *D. carpenteri.* There is further material of *C. crispus* in the NM, Victoria and, according to Curtis's note book (in NM, Victoria), these were collected in 1850; one specimen is *D. aphidum,* the rest are *D. carpenteri.* In both the BMNH and the NM, Victoria, there is a specimen of *C. elegans* (listed by Curtis, 1829*a*: 249 but not described); both specimens are conspecific with *D. carpenteri.* Also in the BMNH is the holotype of *Trichosteresis punctatipennis.* The specimen is from Clober, as stated by Cameron (1907: 161), and bears the species name in Cameron's handwriting. The antennae are brown, not testaceous, but otherwise the specimen fits the published description. It is conspecific with *D. carpenteri.*

In the Curtis collection there is a male and female of *D. carpenteri* mounted on one card. Written on the reverse of the card is 'Bred 28.6 off Roses Gl. Wool'. Curtis did not mention the type-locality but he did say that the species was collected by T. Carpenter. If Gl. Wool is the collector's name then the male and female have no type-status; if it is a locality then they could be syntypes. G. E. J. Nixon designated (unpublished) the male as 'type'; he thought the last word on the label was Wood. I am convinced that the word in question is Wool and I am unable to ascertain the type-status of these specimens. There is a pin in the Haliday collection which bears a label '*carpenteri*' but the specimen is missing from the card and there is no other evidence, apart from the label, to indicate the type-status of the missing specimen. The microscope slides of larval stages (see 'Biology') of *carpenteri* prepared by Mrs Brindley (Miss M. D. Haviland) were donated to the BMNH. There are 36 slides, mostly serial sections of third or fourth instar larvae. There are two whole mounts labelled *Lygocerus cameroni*, and I can confirm that they are *D. carpenteri* (= *cameroni*). This is particularly important as Haviland's work forms the basis of our knowledge of larval development etc. in the genus.

BIOLOGY. As the records for *D. carpenteri* are too extensive to register in full, the following are alphabetical lists of the hosts and parasites.

Hosts (Aphidoidea): *Acyrthosiphon caraganae, A. cyparissiae, A. malvae, A. pisum, A.* sp., *Amphorophora ampullata, A. idaei, Aphis citricola, A. craccae, A. craccivora, A. fabae, A. farinosa, A. frangulae, A. gossypii, A. marthae, A. nerii, A. pomi, A. sambuci, A. schneideri, A. urticata, A. viburni, A.* sp., *Aulacorthum ibotum, A. magnoliae, A. solani, A. syringae, A.* sp., *Betulaphis quadrituberculata, Brachycaudus cardui, B. helichrysi, B.* sp., *Brevicoryne brassicae, Callipterinella calliptera, Capitophorus hippophaes, C.* sp., *Cavariella aegopodii, C. araliae, C. salicicola, C. theobaldi, C.* sp., *Ceruraphis eriophori, Chaetosiphon tetrarhodus, Cinara juniperi, C. laricis, C. piceae, C. pinea, C. pini, C.* sp., *Coloradoa* sp., *Corylobium avellanae, Cryptomyzus* sp., *Diuraphis frequens, D. noxius, Drepanosiphum platanoidis, D.* sp., *Dysaphis plantaginea, D. sorbi, Elatobium abietinum, E.* sp., *Euceraphis punctipennis, E.* sp., *Eucallipterus tiliae, Hamamelistes shirakabae, Hayhurstia atriplicis, Hyadaphis foeniculi, H.* sp., *Hyalopterus pruni, H.* sp., *Hyperomyzus carduellinus, H. lactucae, H. niger, Indomegoura indica, Lipaphis erysimi, Liosomaphis berberidis, Macrosiphoniella absinthii, M. artemisiae, M. grandicauda, M. linariae, M. major, M. millefolii, M. oblonga, M. tanacetaria, M.* sp., *Macrosiphum avenae, M. euphorbiae, M. gei, M. hellebori, M. rosae, M. rudbeckiarum, M. sorbi, M.* sp., *Melanaphis bambusae, Metopeurum fuscoviride, Metopolophium albidum, M. dirhodium, M. festucae, M. poacearum, M.* sp., *Microlophium carnosum, M. evansi, M.* sp., *Mindarus japonicus, Myzaphis rosarum, Myzocallis coryli, Myzus boehmeriae, M. cerasi, M. ligustri, M. persicae, M. varians, M.* sp., *Nasonovia nigra, Neophyllaphis totarae, Ovatus* sp., *Parachaitophorus spiraeae, Periphyllus acericola, P. aceris, P. californiensis, P. hirticornis, P. lyropictus, P.* sp., *Phorodon humuli, Pleotrichophorus glandulosus, Prociphilus fraxini, P. xylostei, Protolachnus agilis, P. thunbergii, Pseudobrevicoryne erysimi, Pterocallis* sp., *Pterocomma salicis, Rhopalomyzus lonicerae, Rhopalosiphoninus deutzifoliae, R.* sp., *Rhopalosiphum insertum, R. nymphaeae, R. padi, Schizaphis agrostis, S. longicaudata, Schizolachnus pineri, S. pineti, S.* sp., *Sipha maydis, S.* sp., *Sitobion akebiae, S. avenae, S. fragariae, S. ibarae, S.* sp., *Staticobium limonii, Symydobius oblongus, Tinocallis platani, Titanosiphon artemisiae, Toxoptera odinae, Toxopterella drepanosiphoides, Tuberocephalus* sp., Tuberculoides sp., *Tuberolachnus salignus, Uroleucon aeneus, U. ambrosiae, U. campanulae, U. cephalonoli, U. chondrillae, U. cichorii, U. cirsii, U. gobonis, U. hypochoeridis, U. jaceae, U. picridis, U. rudbeckiae, U. sonchi, U.* sp.

Primary parasites (Aphidiidae): *Aphidius absinthii, A. aquilus, A. areolatus, A. cingulatus, A. equiseticola, A. ervi, A. funebris, A. gifuensis, A. hieraciorum, A. hortensis, A. longipetiolus, A. matricariae, A. phalangomyzi, A. picipes, A. polygonaphis, A. rosae, A. salicis, A. schimitscheki, A. setiger, A. smithi, A. tanacetarius, A. urticae, A. uzbekistanicus, A.* sp., *Areopraon nipponicum, Binodoxys acalephae, B. angelicae, B. brevicornis, B. centaurae, Calaphidius watanabei, Diaeretiella rapae, Diaeretus leucopterus, Dyscritulus planiceps, D.* sp., *Ephedrus californicus, E. lacertosus, E. minor, E. nacheri, E. niger, E. persicae, E. plagiator, E. salicicola, E.* sp., *Lipolexis gracilis, Lysaphidus erysimi, L. matsuyamensis, L. pleotrichophori, Lysiphlebia japonica, Lysiphlebus ambiguus, L. arvicola, L. dissolutus, L. fabarum, L. fritzmuelleri, L. testaceipes, Metaphidius aterrimus, Monoctonus angustivalvus, M. cerasi, M. pseudoplatani, Pauesia abietis, P. akamatsucola, P. laricis, P. piceaecollis, P. pini, P. salignae, P. unilachni, P.* sp., *Praon abjectum,* *P. absinthii, P. barbatum, P. bicolor, P. capitophori, P. dorsale, P. flavinode, P. gallicum, P. necans, P. pequodorum, P. silvestre, P. volucre, P.* sp., *Trioxys betulae, T. cirsii, T. curvicaudus, T. euceraphis, T. falcatus, T. pallidus, T. pannonicus, T. parauctus.*

The following genera of Cynipoidea and Chalcidoidea have also been recorded as forming part of the host complex of *D. carpenteri:* Cynipoidea – *Alloxysta, Phaenoglyphis;* Chalcidoidea – *Aphelinus, Aphidencyrtus, Asaphes, Coruna, Cyrtogaster, Encyrtus, Pachyneuron.*

D. carpenteri has also been associated with the ants *Formica rufa* and *Lasius fuliginosus* (Hymenoptera: Formicidae) (Kieffer, 1907: 349) and with *Meromyza saltatrix* (Diptera: Chloropidae) (Meyer, 1929: 241). In the BMNH there is a specimen of *D. carpenteri* bred from a Rose Bedeguar gall.

The records of hosts, parasites etc. listed above are taken from material examined, and from the following references: Bankowska (1975: 312); Buckton (1876: 117); Campbell & Mackauer (1975: 419); Chua (1977: 125); Cumber & Eyles (1961: 404); Curtis (1829: 249; 1860: 293); Dean (1974: 414); Dessart (1972*a*: 115–119); Dessart (1975: 267); Dill (1937: 233); Dours (1873: 113); Dunn (1949: 105); Ferrière & Voukassovitch (1928: 28); Fülmek (1968: 900–909); Garbarczyk (1977: 447–448); Gatenby (1919: 405); Gourlay (1930: 339); Hafez (1961: 530); Haviland (1920*a*: 293; 1920*b*: 104); Howard (1890: 247); Kieffer (1907: 48–53); Lowe (1968: 821); Maneval (1940: 96); Marshall (1872: 124; 1896: 569–572); Meyer (1929: 234–244); Muesebeck et al. (1951: 669); Paetzold & Vater (1967: 83); Pass & Parr (1971: 1153); Petherbridge & Mellor (1936: 336); Ratzeburg (1852: 180); Rothschild (1963: 126); Skripchinskii (1930: 281); Spencer (1926: 142–150); Starý (1977: 2–3); Sullivan & Van Den Bosch (1971: 389); Takada (1973: 9–11; 1976: 237); Thuneberg (1959: 23); Tillyard (1926: 283); Todd (1957: 720); Treherne (1916: 186); Valentine (1975: 61); Voukassovitch (1925: 655; 1928: 54); Walden (1926: 295–298); Ward (1934: 144); Westwood (1840: 170); Wimshurst (1925: 93); Yasumatsu et al. (1946: 12; 1947: 113).

The aphids listed above are from most of the systematic groups of the Aphidoidea. The only families not represented are the Adelgidae and Phylloxeridae. The most frequently recorded genera are *Microlophium* (261 records, mostly of *M. carnosum*), *Acyrthosiphon* (154 records), *Macrosiphum* (100), *Aphis* (78, many *A. pomi* records), *Metopolophium* (70, mostly *M. dirhodum*), *Sitobion* (66), *Periphyllus* (60), *Schizolachnus* (56), *Uroleucon* (44), *Macrosiphoniella* (34), *Rhopalosiphum* (32) and *Myzus* (28). All the major genera of Aphidiidae are included in the above records. The most frequently recorded genera are: *Ephedrus* (281 records), *Praon* (258), *Aphidius* (220) and *Pauesia* (74). Both forms of pupation (inside and outside the mummy) are represented.

D. carpenteri has been recorded from a wide range of plants, including coniferous and deciduous trees, herbs, shrubs, cultivated plants and crops, fruit-trees, and plants of wasteland, hedgerows and damp habitats.

The host information for *D. carpenteri* includes records that are typical elements of the following faunistic complexes: Eurasian steppe — *Macrosiphoniella* spp. / *Aphidius absinthii* / *Artemisia* sp.; *Titanosiphon artemisiae* / *Trioxys pannonicus* /–; *Microlophium* spp. / *Aphidius ervi* /–; *Uroleucon* spp. / *Praon dorsale; Acyrthosiphon caraganae* / *Aphidius ervi: Pseudobrevicoryne erysimi*/ *Lysaphidius erysimi* /–. European and Far Eastern deciduous forest — *Drepanosiphum platanoidis* / *Dyscritulus planiceps – Acer pseudoplatanus*; *Periphyllus californiensis* / *Aphidius areolatus* / *Acer* sp. Coniferous forest — *Cinaria laricis* / *Pauesia pini* / *Larix leptolepis*. Holarctic forest tundra—*Pterocomma salicis* / *Aphidius cingulatus* / *Salix* sp.; *Symydobius oblongus* / *Trioxys betulae*. The most frequently represented of the faunistic complexes is the Eurasian steppe. Several gall-forming aphids are represented which are commonly parasitized by *Ephedrus persicae or E. plagiator*. Some wax-producing aphids and their parasites are also listed, e.g. *Brevicoryne brassicae* / *Diaretiella rapae* /–. Starý (1977: 6) records *D. carpenteri* mostly from parks, fields, meadows and waste places, and found that it was numerically the most abundant *Dendrocerus* species, but in some habitats other species were dominant, e.g. *D. bifoveolatus* in moor/pond habitats.

D. carpenteri, which is the only species of *Dendrocerus* to have had its biology well studied, is a hyperparasite of mature larvae or young pupae of Aphidiidae (or on secondary parasites); the Aphidiidae are in turn parasites of Aphidoidea. The aphidiid larva consumes the aphid and pupates inside the empty aphid skin. As the female of *D. carpenteri* only oviposits into aphids containing a mature parasite larva or pupa, *D. carpenteri* cannot be a direct parasite of the aphid. According to Haviland (1920*b*: 103) and Spencer (1926: 142) *D. carpenteri* can parasitize other larvae of *D. carpenteri,* and Haviland could not find any other hymenopteron that parasitized *D. carpenteri* larvae. The complexity of parasitism and hyperparasitism can be seen from one example recorded by Haviland (1920*b*: 103): a *Microlophium carnosum* (= *Macrosiphum urticae*) was parasitized by *Aphidius ervi* which had been hyperparasitized by an undetermined species of Chalcid which in turn had been partially devoured by a second hyperparasite which had been hyperparasitized by *D. carpenteri.*

The development of *D. carpenteri* occurs outside the body of the host. The egg is elliptical, becoming more spherical as development proceeds. It measures 0·25 mm by 0·1 mm, is white, semi-translucent, and has a minute teat-like protuberance at one end. (Spencer, 1926: 143 records a protuberance at both ends.) The chorion surface has numerous longitudinal striae. According to Haviland (1920*b*: 106) and Spencer (1926: 143) the egg hatches in about 24 hours, but Rothschild (1963: 127) states that at 25°C the first instar larva hatches after two days.

The first instar larva grows to 0·45 by 0·22 mm. It is white, transparent, with thirteen body segments (Fig. 21) (there is some variation in the number of body segments given by authors for the instars). The distinct head has two small tactile papillae and the mouth has two slender mandibles. When newly hatched only two pairs of spiracles are open, one near the posterior margin of the first body segment and the other on the anterior part of the fourth body segment, but the spiracles of the third and fifth segments open shortly afterwards. The midgut is closed, it is large and its contents are yellow. The first instar lasts 20–24 hours. The larva can progress by a kind of peristaltic movement but it probably does not move around as the host skins normally have only one puncture mark. If the host is in the pupal stage the *D. carpenteri* larva is usually found feeding on the posterior part of the abdomen where the integument is still soft. As the egg is deposited on the third or fourth segment of the aphidiid the *D. carpenteri* larva must move to this position.

The second stage larva (Fig. 22) measures 0·7 by 0·35 mm and differs from the first instar chiefly by the more developed tracheal system and the greater development of the anterior part of the body so that the head appears to be divided from the thorax by a constriction. The stigmatic trunks of segments six, seven and eight are visible but the corresponding spiracles are closed. This stage lasts 24–36 hours. The hyperparasite seems to feed by suction and the skin of the aphidiid (otherwise uninjured) is gradually emptied of its contents.

The third stage larva (Fig. 23) is globose and about 1·00 mm long by 0·75 mm broad. In this stage the head is bent round ventrally, the papillae on the head disappear and the spiracles on body segments six, seven and eight are open. The mandibles work vigorously and are probably used to macerate the host organs. This stage lasts for about 40 hours.

The fourth stage larva (Fig. 24) measures 1·0 by 0·83 mm when fully fed (1·4 mm long according to Rothschild, 1963: 127). It becomes creamy white and ingests the last of its host. It differs considerably from the third stage larva. The first four body segments are greatly developed, the small head is bent round to the ventral side and is almost hidden by the large prothorax. The last abdominal segment bears dorsally a conical caudal appendage of unknown function. The body segments bear a row of chitinous papillae or spines. The salivary glands and malpighian tubes have considerable lumina. The midgut, which fills the greater part of the body cavity, contains a mass of fluid which is churned to and fro by muscular contractions. At this stage there are seven pairs of spiracles, the first pair near the posterior margin of segment one, the second on the posterior side of the third segment and the rest on the following five segments. The eighth spiracle does not become functional until metamorphosis. Rudimentary stigmatic trunks can sometimes be seen on the ninth and tenth segments. The fourth instar lasts from one and a half to three days.

D. carpenteri pupates within the cocoon spun by the aphidiid. Just before metamorphosis the midgut opens to the hindgut and the contents are voided. The pupa is yellow at first but gradually darkens until it is black. According to Spencer (1926: 145) this stage lasts six to eight days but Haviland (1920*b*: 121) states that the period of pupation is from 14–16 days and Rothschild (1963: 127) gives the mean duration of the pupal stage (at 25°C) as eight days. The imago gnaws a hole in the aphid mummy and emerges. The hole has irregular margins and thus differs from the emergence hole of aphidiids.

According to Spencer (1926: 145) a generation can occupy 11–16 days, the average being 12 days, while Haviland (1920*b*: 106–121) indicates 22–25 days and Rothschild (1963: 127) 18 days. These variations in development times are presumably due to different temperatures. Campbell & Mackauer (1975: 422) studied the influence of temperature on development rate. It took 9·4 days at 25·9°C and 42·69 days at 10·3°C for the parasite to develop from egg to adult. The parasite developed more slowly than its host, at the same temperature. This may ensure that the parasites do not appear too early in the season and that a continued minimum host supply is available.

Copulation may last from 20 seconds to 15 minutes and can take place a few hours after emergence. Rothschild (1963: 126) noted that the males mate repeatedly with the same female but Haviland (1920*b*: 105) stated that they only paired once.

According to Rothschild (1963: 126) oviposition may last from 90 seconds to 15 minutes. When a suitable host is found the female of *D. carpenteri* energetically examines it with her antennae. The female stands on or behind the aphid so that the ovipositor, when inserted, punctures the aphidiid larva (lying, bent head to tail in the cocoon) at its centre of curvature. Usually only one egg is laid. Spencer (1929: 143) observed that two eggs were sometimes laid but only one adult emerged. Rothschild (1963: 126) recorded one instance where an unmated *D. carpenteri* female appeared to oviposit in the normal way but no eggs were laid. Haviland (1920*b*: 106) estimated the total number of eggs laid by a single female to be less than 25.

Adults live up to 10 days and Takada (1976: 383) gives the possible number of generations in a year for *D. carpenteri* as between two and six. *D. carpenteri* is active from May to November. Kieffer (1907: 50) records *D. carpenteri* (as *aphidivorus* var. *inconspicuus*) over-wintering in moss, and Takada (1976: 383) and Dunn (1949: 106) indicate that it over-winters within the aphid mummy or can sometimes survive the winter as adults.

Haviland (1920*b*: 105) recorded that the sex ratio was 2:3 (males: females). Dunn (1949: 105) gave the sex ratio as 2:1. The work of Garbarczyk (1977:445–454) showed a preponderance of females (61.9%). Spencer (1926: 145) induced virgin females to oviposit; the resultant adults were all males.

Although *D. carpenteri* is a very common species the numbers of aphids are so great that the overall rate of parasitism is quite low. Hafez (1961: 471) and Chua (1977: 138) both give a figure of under 2%, Bankowska (1975: 312) recorded 3.4%, Low (1968: 825) recorded a 5.5% parasitism rate and Dean (1974: 415) gave 3.2% and 12% for two different hosts. Because it is last in the chain of parasites *D. carpenteri* is often the least common member of the aphid parasite complex. Haviland (1920*b*: 125) recorded it as comprising 32–44% of the parasites of Aphidiidae. Takada (1976: 252), studying the parasites of aphids on potatoes and cruciferous crops, found that it emerged in a higher proportion from parasitized aphids on the upper leaves, than from those on the lower leaves.

MATERIAL EXAMINED

Dendrocerus carpenteri (Curtis), neotype ♂, **Belgium:** La Hulpe, 2.vi.66 (IRSNB, Brussels). *Ceraphron hyalinatus* Thomson, lectotype ♂, **Sweden:** 'Ld [Lund], 9.viii.6' (NR, Stockholm). *Trichosteresis punctatipennis* Kieffer, holotype ♀, **Great Britain:** 'Clober [Scotland, Central] 100' (*Cameron*) (BMNH). *Lygocerus rufiventris* Kieffer, lectotype ♀, **Great Britain:** '439' (*Cameron*) (BMNH). *Lygocerus aphidivorus* Kieffer, lectotype ♀, **Great Britain:** '365 Kelvin [Scotland, Central Kelvinside] 10/6' (*Cameron*) (BMNH). *Lygocerus cameroni* Kieffer, lectotype ♀, **Great Britain:** 'York [=Yorkshire] 384 Cameron coll.' (BMNH). *Lygocerus thomsoni* Kieffer, lectotype ♀, **Sweden:** 'Ld [Lund] 8/6' (NR, Stockholm). *Lygocerus inquilinus* Kieffer, holotype ♂, **Germany (West):** 'Kol [or Rol] 4. 16/9/11 Iserlohn b *F. rufa*' (NHM, Maastricht).

738 ♂, 1029 ♀. **Belgium:** Moresnet. **China:** Foochow. **Germany (West):** Kehl; Westfallen, Plellenburg. **Great Britain.** Bedfordshire; Berkshire; Buckinghamshire; Cambridgeshire; Cheshire; Cumbria; Devon; Dorset; Durham; Essex; Hampshire; Hertfordshire; Highland; Isles of Scilly; Kent; Greater London; Lancashire; Greater Manchester; West Midlands; Norfolk; Northamptonshire; Northumberland; North Yorkshire; Oxfordshire; Powys; Somerset; South Glamorgan; Staffordshire; Strathclyde; Suffolk; Surrey; Sussex (East); Sussex (West); West Yorkshire. **India:** Kashmir. **Ireland:** Antrim; Down; Dublin; Kildare; Leitrim; Londonderry; Sligo; Wicklow. **Italy:** Dolomites, Seils am Schlern; Sicily, Villafranca; South Tirol. **Japan:** Atami; Hokkaido, Sapporro; Honshu, Kure. **Netherlands:** Arnhem; Bennekom; Brandrvÿk; Dwingelo; Ede; Epen; Groningen; Gronsveld; Hazerswonde; Helmond; Hemmen; Kootwick; Langbrock; Leersum; Lienden; Lunteren; Mheer; Oenkerk; Rhenen; Rijswizk; Schiermonnikoog; Tiel; Wageningen;

Wessem. **Sweden:** Skåne, Rolsberga, Rovurekulan; S., Lund; Sm. Våxjö S. Areda. **Switzerland:** Zürich. **U.S.S.R.:** Vilnius, Verzuva.

FURTHER DISTRIBUTION. Europe: Austria (Dessart, 1972*a*: 120); Czechoslovakia (Starý, 1977: 2). North & South America: Canada (Dessart, 1972*b*: 239); Chile (Dessart, 1975: 267). Australasia: Australia (Dessart, 1972*b*: 240).

Dendrocerus dubiosus (Kieffer) **sp. rev.**

(Figs 20, 46, 49, 58)

Ceraphron longicornis Thomson, 1858: 293. Holotype ♀, SWEDEN: 'Malmö 7/56' (lost). [Primary homonym of *Ceraphron longicornis* Boheman, 1832: 337.]

Lygocerus pallipes Kirchner, 1867: 193. Nomen nudum.

Conostigmus dubiosus Kieffer, 1907: 152. Lectotype ♀, GREAT BRITAIN (BMNH), designated by Masner (1965: 15) [examined].

Lygocerus flavipes Kieffer, 1907: 54. Holotype ♀, ITALY (MCSN, Genoa) [examined]. [Secondary homonym of *Dendrocerus flavipes* Kieffer, 1907: 23.] **Syn. n.**

Lygocerus claripennis Kieffer, 1907: 43. Holotype ♂, ITALY: Genoa, 1894 (*Solari*) (MCSN, Genoa). **Syn. n.**

Lygocerus rectangularis Kieffer, 1907: 44–45. Lectotype ♂, GREAT BRITAIN (BMNH), designated by Masner (1965: 20) [examined]. **Syn. n.**

Conostigmus alpestris Kieffer, 1907: 143–144. Holotype ♀, ITALY (MCSN, Genoa) [examined]. **Syn. n.**

Dendrocerus navaensis Dessart, 1966: 12. [Replacement name for *Lygocerus flavipes* Kieffer, 1907: 54.] **Syn. n.**

Dendrocerus dubiosus (Kieffer) Dessart, 1972*a*: 125.

Lygocerus flavus Hellén, 1966: 14. Holotype ♀, FINLAND (ZMU, Helsinki) [examined]. **Syn. n.**

[*Dendrocerus bicolor* sensu auct., nec Kieffer. Misidentifications.]

FEMALE. Scape very long, 5.7–7.0 times longer than broad and much longer than head (except for one brachypterous specimen in which it is 5.4 times longer than broad). AIII elongated, up to 4 times as long as broad, clearly longer than AII (Fig. 58). Segments AVI to AX 1.7–2.0 times longer than broad, AXI longer. Ventrally Flagellar segments flat with central ridge. Antenna usually longer than body; weakly papillate; pubescence short, dense; brown except distal end of AII, which is slightly lighter, and base of scape, which is yellow.

Head mostly alutaceous, frons often almost smooth; black or dark brown, mandibles yellow with red teeth, palps colourless; pubescence short. Eyes large, almost as long as distance between torulus and preoccipital crescent. Eye pubescence short but distinct. Interantennal carina distinctly developed and curved over central swelling between toruli. A shallow depression present behind and inwards from each torulus. Frontal dent shallow but can be conspicuous. Depressions near lateral ocelli shallow, that in front of median ocellus usually large and conspicuous. Ocellar triangle broad. Lateral ocelli joined by distinct posterior horizontal groove. Preoccipital crescent present but not strongly developed, not usually reaching eyes.

Thorax black or dark brown, mostly alutaceous or coriaceous, pubescence short, sometimes quite dense. Anterior corners of mesonotum sharply angled. Notaulices complete, clearly curved outwards towards anterior corners of mesonotum. Four secondary furrows often visible. Axillae mostly flat, only downcurved in outer region. Metanotal and propodeal furrows strongly foveolate. Propodeal fovea small but prominent. Y-shaped furrow on side of pronotum distinct. Legs entirely yellow, basal half of hind coxa very rarely dark.

Forewing with light but distinct brown area under pterostigma, veins often indicated as clear lines in brown area. Pterostigma semiovoid, radius distinctly curved, about 1.3 times longer than pterostigma. Wing pubescence normal.

Gaster smooth; 1.5–2.0 times longer than broad. Gastral collar long, well developed, with several parallel carinae. Gastrocoeli visible in dark specimens as two lighter brown areas.

MALE. As for female except scape short (L/B 5.0 or more), nearly equal to length of head, nearly as long as AII, AIII and AIV together. Basal flagellar segments elongate (AIII usually clearly the longest), clearly asymmetrical (Fig. 49), pubescence longer than breadth of segments. Basal third of scape usually yellow, flagellum brown or black but AII distinctly lighter. Legs generally darker than in female, often mostly yellow.

REMARKS. As *Lygocerus bicolor* Kieffer, 1907 (but not *bicolor* of authors) is now synonymized under *D. aphidum* (see p. 266) a new replacement name is required for *Ceraphron longicornis* Thomson. Of the synonyms now assigned to this species the names published by Kieffer in 1907 have precedence; *Conostigmus dubiosus* has been chosen because the lectotype is female and easily accessible.

Dessart (1972*a*: 143) considered *D. flavus* and *D. dubiosus* (= *bicolor* auct., nec Kieffer) to be closely related but distinct; however *D. flavus* is just a brachypterous form of *D. dubiosus*. Many of the stated differences are within the range of variation of *D. dubiosus* and the rest are consistent with wing reduction. Both known specimens are female. The second specimen was collected at the same time as a normal *D. dubiosus*, and I have seen a specimen of *D. dubiosus* with three-quarter-length wings.

Females of *D. dubiosus* are separable from *D. aphidum* females by the long scape and long AIII (compared with the length of AII) of *D. dubiosus*. In large specimens of *D. aphidum* the scape is sometimes long but the length of AIII is always about equal to AII. The legs of *D. dubiosus* females are entirely yellow with the exception of two dark specimens which have a dark basal half to the hind coxa. The legs of *D. aphidum* females always have some dark coloration, at the very least the basal half of the hind coxa is dark. Small specimens of *D. aphidum* can often have entirely dark legs. The males are more difficult to separate but generally the scape is shorter and the leg colour darker in *D. aphidum* than in *D. dubiosus*. The males of *D. aphidum* and *D. dubiosus* could conceivably be placed in the same species but the range of variation in the females is far too great for synonymy.

Previously I named a series of specimens from Akureyi, Iceland as *D. bicolor* (i.e. *bicolor* sensu auct. = *dubiosus*) and Couchman (1977: 123) published this determination. After comparison with types and other material, I have now decided that they are large specimens of *D. aphidum*.

Dessart has labelled a specimen from the Cameron collection as '? paralectotype of *bicolor*'; it is not conspecific with the type-material, it is a specimen of *D. dubiosus* and has no type-status.

After *D. carpenteri*, *D. dubiosus* is one of the more common species of *Dendrocerus*.

BIOLOGY. *Acyrthosiphon pisum* / *Aphidius ervi* / *Medicago sativa* 17.vi.1967 and 18.vii.1969 (Starý, 1972: 2); *A. pisum* / *Aphidius* sp. / *Medicago sativa* (Boness, 1958: 322); 1 ♂, *A.* sp. / *Praon dorsale* / *Trifolium pratense* (Takada, 1973: 8); *Amphorophora rubi* /–/ *Rubus* sp. 21.vi.1914; 1 ♂, 6 ♀, Aphidiid sp. / *Praon* sp. / *Orixa japonica* (Takada, 1973: 8); *Aphis craccivora* / *Binodoxys acalephae* / *Onobrychis sativa* 1.vi.1960 (Starý, 1977: 2); *A. craccivora* / *Lysiphlebus fabarum* / *Onobrychis sativa* 1.vi.1960 (Starý, 1977: 2) *A. fabae* /*Binodoxys angelicae* / *Papaver* sp. 18.vi.1959 (Starý, 1977: 2); 2 ♀, *Aulacorthum magnoliae* / *Praon volucre* / *Sambucus siebaldiana* (Takada, 1973: 8); 1 ♀, *A. magnoliae* / *Praon volucre* /– 11.v.1963; 1 ♂, 2 ♀, *A. syringae* / *Praon volucre* / *Syringa reticulata* (Takada, 1973: 8); *Cryptosiphum artemisiae* / *Ephedrus nacheri* / *Artemisia vulgaris* 9.vi.1958 (Starý, 1977: 2); *Galiobium langei* / *Aphidius metricariae* / *Galium* sp. 26.vi.1974 (Starý, 1977: 2); 1♂, 1♀, *Hyalopteroides humilis* /– *Dactylis glomerata* 28.v.1972; *Macrosiphum rosae* / *Aphidius rosae* / *Rosa* sp. 5.vi.1961 (Starý, 1977: 2); 1 ♀, *Microlophium carnosum* / *Praon* sp. / *Armoracia rusticana* 31.viii.1934; 1 ♀, *Rhopalosiphoninus deutzifoliae* / *Ephedrus* sp. / *Deutzia crenata* (Takada, 1973: 8); 1 ♀, *Schizolachnus* sp. / *Pauesia unilachni* / *Pinus densiflora* (Takada, 1973: 8); *Sitobion avenae* / *Aphidius ervi* / *Triticum vulgare* 2.vii.1975 (Starý, 1977: 2); *S. avenae* / *Aphidius uzbekistanicus* / *Triticum vulgare* vii. 1975 (Starý, 1977: 2); 1 ♂, *S. avenae* /–/ *Hordeum* sp. 26.vi.1972; *S. equiseti* / *Aphidius equiseticola* / *Equisetum silvaticum* (Starý, 1977: 2); *S. equiseti* / *Ephedrus plagiator* / *Equisetum silvaticum* (Starý, 1977: 2); *S. equiseti* / *Monoctonus caricis* / *Equisetum silvaticum* (Starý, 1977: 2); *Therioaphis trifolii* / *Praon exoletum* / *Medicago sativa* 23.v.1960 and 30.viii. 1967 (Starý, 1977: 2); *Uroleucon aeneus* / *Ephedrus niger* / *Carduus acanthoides* 28.vi.1961 (Takada, 1973: 8); –/–/ *Medicago sativa* (Bankowska, 1975: 312).

Dessart (1972*a*: 85) recorded *D. dubiosus* from *Aphidius picipes*, *Diaeretiella rapae*, *Ephedrus plagiator* and *Praon volucre*. Donisthorpe (1927: 106) recorded it in association with *Lasius brunneus* (Hymenoptera: Formicidae); as there is no other evidence of ant association it is probable that this was just a chance encounter.

D. dubiosus is recorded from a considerable range of hosts. There are several records characteristic of the Eurasian steppe complex, i.e. *Acyrthosiphon* spp. / *Aphidius ervi*, *Aphis* spp. / *Lysiphlebus fabarum*, *Aphis* spp. / *Binodoxys angelicae*, *Cryptosiphum artemisiae* / *Ephedrus nacheri* / *Artemisia vulgaris and Galiobium langei* / *Aphidius matricariae*. There are also records characteristic of the European deciduous forest complex, i.e. *Macrosiphum* spp. / *Aphidius rosae*, *Sitobion* spp. / *Monoctonus caricis* and *Acyrthosiphon* / *Praon volucre*. The *Schizolachnus* sp. /

Pauesia unilachni / Pinus record is the only one from the coniferous forest complex. The aphids listed above are from diverse families (Lachnidae, Callaphididae and Aphididae). The primary parasites are all Aphidiidae, and all the common genera are represented. *D. dubiosus* is recorded from a wide diversity of plants, including trees, shrubs and herbs, and on three occasions from *Equisetum* (Equisetineae); it has been collected over much of the year and appears to be most abundant in July and August. Takada (1973:15) listed *D. dubiosus* (as *bicolor*) under an 'immediate' type of habitat (shrubs, orchards and gardens), but the above records indicate a much wider habitat range, from forest to fields and wasteland.

MATERIAL EXAMINED

Conostigmus dubiosus Kieffer, lectotype ♀, **Great Britain:** '356, Clober [Scotland, Central] 1.vi.' (*Cameron*). *Lygocerus flavipes* Kieffer, holotype ♀, **Italy:** 'Nava 108, viii. 1902' (*Solari*) (MCSN, Genoa). *Lygocerus rectangularis* Kieffer, lectotype ♂, **Great Britain:** '372, Dumfries' [Scotland, Borders] (*Cameron*). *Conostigmus alpestris* Kieffer, holotype ♀, **Italy:** 'Nava, viii 902' [1902] (*Solari*) (MCSN, Genoa). *Lygocerus flavus* Hellén, holotype ♀, **Finland:** Lemland, 11.viii.1953 (*Hellén*) (ZMU, Helsinki).

105 ♂, 99 ♀. **Austria:** Semmering region, Ruchenau dist. **France:** Pyrénées-Orientales, nr Vernet-les-Bains. **Great Britain:** Bedfordshire: Dunstable Down, Steppingly; Berkshire: Streatley, Silwood Pk, Thatcham Moor, Windsor, Wytham; Buckinghamshire: Burnham Beeches, Slough; Cambridgeshire; Devon: Heathfield; Dorset: nr Stoborough; Dumfries and Galloway: Dumfries; Grampian: Elgin; Greater London: Kew, New Malden, Richmond; Gwent: Newton; Hampshire: Brockenhurst, Lyndhurst, New Forest; Hertfordshire: Rothamsted; Leicestershire: Charnwood Forest; Lothian: Edinburgh: Mid Glamorgan: Kenfig Pool; Northamptonshire: Spratton; Oxfordshire: Headington; Shetland: Fetlar, Unst, Haroldswick; Somerset: Brompton Regis; Strathclyde: Aran, Catacol, Beinn Bhreac, Cawbber; Suffolk: Barton Mills; Surrey: Ashtead, Bookham, Clandon Downs, Farnham, Oxshott; Western Isles: Lewis, Greeta, **Ireland:** Dublin: Bohernabreena, Grand Canal, Mantfield, Phoenix Park; Kildare: R. Canal, Landenstown, Trawallna; Longford: Castle Forbes; Wicklow: Ballyknockan, Dowry. **Italy:** Sicily, Villafranca. **Japan:** Honshu, Tokyo. **Sweden:** Bräkne, Hoby; B., Sjöard; Halleberg; Örebro, Adby; Skåne, Höör dist.; S., Kivik; S., Loderup; S., Ring: S., Stensöffa.

FURTHER DISTRIBUTION. Algeria (Dessart, 1979: 33); Belgium (Dessart, 1972*a*: 87); Czechoslovakia (Starý, 1977: 2); Faroes (Kryger & Schmiedeknecht, 1938: 76); Germany (West) (Dessart, 1972*a*: 87); Iceland (Dessart, 1972*a*: 87); Norway (Dessart, 1972*a*: 87); Switzerland (Dessart, 1972*a*: 87).

Dendrocerus flavipes Kieffer

(Figs 30, 35, 62)

Dendrocerus flavipes Kieffer, 1907: 22–23. Holotype ♀, ITALY (MCSN, Genoa) [examined].
Dendrocerus fuscipes Kieffer, 1907: 23–24, pl. 2, fig. 9. Holotype ♂, ITALY (MCSN, Genoa) [examined]. [Synonymized by Dessart, 1978: 181.]
Atritomellus flavipes (Kieffer) Kieffer, 1914: 143–144.

FEMALE. Scape elongate, longer than maximum breadth of thorax or antennal segments II, III and IV together. Scape brown but often lighter ventrally at base. AIII long, clearly longer than pedicel or AIV. Distal flagellar segments approximately as broad as scape. Flagellar segments with median groove, flat ventrally. Flagellum brown, papillate, with short pubescence.

Head alutaceous; brown but clypeus usually yellow, palps and mandibles yellow or colourless, teeth of mandibles red-brown. Eyes large, 0.65–0.75 times as long as lateral length of head. Pubescence short. Interantennal carina absent or indicated only by dark line. Frons alutaceous. Ocellar triangle broad, lateral ocelli slightly closer to eyes than to median ocellus. Preoccipital crescent present, with a fine vertical furrow centrally. Head rounded, not strongly transverse; pubescence short.

Thorax elongate, laterally compressed ($L/B = 1{\cdot}6–1{\cdot}9$), clearly narrower than head; generally alutaceous, brown to testaceous (sometimes bicoloured: brown with pronotum and mesonotum testaceous). Pronotum always testaceous dorsally and testaceous laterally, at least in anterior region. Propleura testaceous. Anterior margin of mesonotum clearly defined. Notaulices not reaching posterior mesonotal margin, fading out immediately after bend although, in specimens with light coloured mesonotum, their continued path is sometimes indicated by faint line. Secondary furrows distinct. Axillae strongly curved downwards. Scutellum narrow, highly arched, sometimes flattened centrally Propodeal carinae united to form small median projection. Legs pale yellow to light brown except claws and last tarsal segments which are brown.

Forewing with brown transverse band under pterostigma and radius. Pterostigma semioval, not broad. Radius not sharply curved. Pubescence short; fringe occasionally hard to distinguish.

Gastral collar colourless or light yellow, strongly contrasting with rest of gaster, which is brown; broad with many fine carinae. Gaster long and narrow.

MALE. As for female except scape short, approximately same length as AIII, certainly shorter than AII plus AIII; broad, about 2.5 times as long as broad. Basal flagellar segments broad, strongly asymmetrical (Fig. 30), distal segments cylindrical. Antenna papillate, uniformly dark, pubescence shorter than maximum breadth of segment, pubescence of scape very short. Eyes not elongated. Frons broad; preoccipital crescent clearly developed, reaching ocelli and nearly reaching margin of eye. Body darker than female, black or brown. Wings colourless. Legs brown, distal ends of femora, tibiae and tarsi sometimes lighter. Abdominal collar dark.

REMARKS. *D. flavipes* is known only from females and *D. fuscipes* only from males. Dessart (1972*a*: 153) described a ♀ of *fuscipes* which is a female of *D. halidayi,* as the wings are not clearly smoked and the body coloration is uniform. The strong sexual bicoloration found in *D. flavipes* is unusual in *Dendrocerus* but it does also occur in *D. indicus* and possibly some African species. *D. flavipes* is similar in thoracic shape and to a lesser extent in general coloration to females of *D. halidayi,* and to *D. laticeps* and *D. laevis* in having the notaulices only present anteriorly, but the last two species are darker and have a much broader thorax. *D. flavipes* is here recorded for the first time from Great Britain.

BIOLOGY. Dessart (1978: 177) recorded *D. flavipes* from *Coniopteryx esbenpeterseni* (Neuroptera). *D. flavipes* has been found on *Aesculus hippocastanum, Crataegus* and *Quercus robur,* and under *Fagus sylvatica.* Collected mostly in July and August.

MATERIAL EXAMINED

Dendrocerus flavipes Kieffer, holotype ♀, **Italy:** Genoa, '75', vi.1900 (*Borgioli*) (MCSN, Genoa). *Dendrocerus fuscipes* Kieffer, holotype ♂, **Italy:** Genoa, '105', vi.1900 (*Borgioli*) (MCSN, Genoa).

6 ♂, 10 ♀, **Great Britain.** Berkshire: Slough; Devon: Heathfield; Greater London: Kew; Hampshire: Shawford; Hereford and Worcester: Burghill; Kent: Eynsford; Northamptonshire: Spratton; Surrey: Ashtead, Oxshott Woods, Weybridge; Sussex: Eridge Park. **Ireland:** Wicklow, Dowry and Athdown. **Sweden:** Öl...[label illegible, slide No. 6911/062] (ZI, Lund). **Yugoslavia:** Dalmatia, Korčula.

FURTHER DISTRIBUTION. France (Dessart, 1972*a*: 156); Germany (Hellén, 1966: 14); Switzerland (Dessart, 1972*a*: 156); doubtfully (see Dessart, 1972*a*: 142) Finland (Hellén, 1966: 14).

Dendrocerus halidayi (Curtis)

(Figs 32, 45, 63)

Ceraphron halidayi Curtis, 1829*a*: 249, fig. Holotype ♂, IRELAND (NMI, Dublin) [examined].
Megaspilus halidayi (Curtis) Stephens, 1829: 401.
Dendrocerus lichtensteinii Ratzeburg, 1852: 181. Syntype(s), no locality (lost). [Synonymized by Dessart, 1966: 5.]
Ceraphron damicornis Foerster, 1856: 146. Nomen nudum. ['Synonymized' by Kieffer, 1907: 20.]
Ceraphron callicerus Thomson, 1858: 292. Holotype ♂, SWEDEN (NR, Stockholm) [examined]. [Synonymized by Dessart, 1966: 5.]
Lygocerus halidayi (Curtis) Marshall, 1868: 158.
Lygocerus halidayii Marshall, 1873: 3. [Unjustified emendation.]
Dendrocerus halidayi (Curtis) Dessart, 1966: 5.
[*Dendrocerus fuscipes* Kieffer; Dessart, 1972*a*: 153. Misidentification.]

FEMALE. Scape (Fig. 63) long and thin (L/B 5.5–6.5), nearly as long as AII, AIII, AIV and AV together. AIII longer than AIV. AII and AIII longer and less broad (L/B 2.0–3.5) than rest of flagellum, which is relatively thick (L/B 1.2–1.5). Flagellar segments ventrally flattened. Antenna mostly coriaceous; brown, base of scape clear brown, distal segments darker brown; pubescence short, dense and evenly distributed.

Head alutaceous pubescence short, eye pubescence very short; brown, slightly darker than thorax or base of gaster. Mandibles brown with darker teeth, palps colourless. Head rounded, not transverse but clearly broader (1.3–1.4 times broader) than thorax. Interantennal carina present, with horseshoe-shaped depression linking toruli. Ocellar triangle broad and shallow, ocelli almost in line. Depression in front of median ocellus conspicuous, lateral depressions joined by groove running behind ocelli. Preoccipital crescent present but not strongly developed, not reaching margin of eye. Crescent with central furrow.

Thorax brown; alutaceous; with short pubescence except for tuft of long hairs on propodeum above hind coxa; long and thin (L/B 1.5–2.0), clearly narrower than head. Notaulices distinct anteriorly before bend but indistinct or, more often, absent posteriorly. Axillae strongly downcurved. Scutellum long, thin and highly arched, 1.6–1.8 times longer than broad. Metanotum reduced; salient median fovea present between metanotum and propodeum. Propodeum obliquely down-curved, shiny, with large carinae and fine alutaceous sculpture. Legs brown, darkest on hind coxa and lightest on anterior tibia. Wings almost hyaline, pterostigma semioval, radius thin, vannal lobe absent.

Gaster mostly smooth and brown, anterior half slightly lighter brown; long and thin (L/B 1.9–2.4), clearly longer than thorax. Gastral collar dorsally with few short carinae, often only four, and with small tuft of long hairs on each side.

MALE. As for female except scape short and broad (L/B 3.0–3.6). AIII and AIV short, even with AII they are shorter than scape (Fig. 32). AVI and AVII very long (L/B 6.0–9.5). Segments AIII to AVI each with long projection, which is slightly swollen apically (Fig. 32). On AIII to AVI the projections are longer than segments, but projection on AVII shorter than length of segment. AVII is clearly longest segment. AVIII usually with small projection or hump. Antenna with long pubescence, especially on projections; brown but basal half of scape sometimes lighter. Head 1.10–1.25 times as broad as thorax. Preoccipital crescent slightly larger than in female, reaching eyes and ocelli. Notaulices continuous but sometimes faint posteriorly. Pubescence not long but generally dense and obvious. Wings clear.

REMARKS. In his description of *Ceraphron halidayi,* Curtis (1829*a*: 249) stated that the insect was taken on the 8th August near Holywood (Ireland), that it was in the Haliday collection and that the female was unknown. Dr J. P. O'Connor has searched the Haliday collection for this species and found a specimen which closely corresponds with the original description and figure and also with the accepted concept of *halidayi.* The specimen is unlabelled (except for the registration number 20.2.82) but this is quite normal in the Haliday collection. This specimen is undoubtedly the holotype of *C. halidayi;* thus the neotype designation by Dessart (1972a: 161) was unnecessary.

In the Curtis collection there are two males of *D. halidayi.* As the style of card and label for one specimen is almost certainly that of Haliday, G. E. J. Nixon has labelled it 'probably paratype of *C. halidayi*'.

The antennae of *D. halidayi* males are similar in form to those of *D. ramicornis;* the females of *D. halidayi* and to a lesser extent the males have the thorax and coloration similar to those of *D. flavipes.*

Although the syntype(s) of *D. lichtensteinii* (type-species of the genus *Dendrocerus*) are lost the figure and description clearly show it to be a synonym of *D. halidayi.* Some authors have incorrectly omitted the terminal '*i*' of the original spelling '*lichtensteinii*'.

BIOLOGY. *D. halidayi* is a solitary, external parasite within the cocoon of Coniopterygidae (Neuroptera).

Viggiani (1967: 173–175) bred *D. halidayi* from *Semiadalis aleyrodiformis* and the degree of parasitism was 10% or less. He described the parasite larva as orange with a distal terminal digitiform process.

Withycombe (1923: 590–591; 1924: 117) bred a *Lygocerus* sp. from *Conwentzia psociformis.* Because of the close relationship of the two host genera and Withycombe's description of the larva as orange-pink it seems likely that the *Lygocerus* sp. was *D. halidayi.* Withycombe stated that prior to oviposition a small hole was usually torn in the host envelope by the parasite female, but this hole was not always visible. When biting this hole the parasite may also bite or bruise the thorax of the larva, 'probably to prevent pupation'. A single egg is laid alongside the larva, within the cocoon. The parasite larva is fully fed by winter and pupates in early summer, the adult parasite emerging in mid-summer of the second year. Withycombe thought the parasite was single brooded but there was some evidence of two broods.

The neotype and neoparatypes of *D. halidayi* were all bred from *Semiadalis aleyrodiformis* (Dessart, 1972*a*: 166).

Several specimens have been obtained from galls. Ratzeburg (1852: 181) obtained *D. lichtensteinii* from galls of *Biorhiza pallida* (= *Cynips terminalis*) and specimens of *D. halidayi* have been collected from second year galls of *Biorhiza pallida* on oak. As the *Conwentzia* and *Semiadalis* species listed above are abundant on oak, it is likely that a host cocoon was present on or in the oak gall. As the second brood of *C. psociformis* often prefers to spin its cocoon in a crevice, it may occasionally choose the inside of an empty gall.

D. halidayi has been collected as early as May, but from the records August appears to be the month of maximum emergence.

MATERIAL EXAMINED

Ceraphron halidayi Curtis, holotype ♂, **Ireland:** 20.11.82 (*Haliday*) [no further data] (NMI, Dublin). *Dendrocerus halidayi* (*Curtis*), neotype ♂, **Italy:** Portici, vi.-xi.1934 (IRSNB, Brussels). *Ceraphron callicerus* Thomson, holotype ♂, **Sweden:** Dalarne (Boheman) (NR, Stockholm).

5 ♂, 6 ♀. **Great Britain.** Devon: Heathfield, Torquay dist.; Hampshire: New Forest, Denny Wood. **Italy:** Portici (neoallotype and neoparatype of *D. halidayi*) (IRSNB, Brussels). **Sweden:** K1 [rest of label illegible] (ZI, Lund); Ör. Ö. Mack. (neoparatype of *D. halidayi*) (ZI, Lund); [label illegible] (ZI, Lund); [label illegible] A. J. [= (*Jansson*)] (allotype of *D. fuscipes*) (ZI, Lund).

FURTHER DISTRIBUTION. *D. halidayi* is also known from Germany (East) (Ratzeburg, 1852: 181).

Dendrocerus laevis (Ratzeburg)

(Figs 25, 36, 48, 61)

Ceraphron laevis Ratzeburg, 1852: 180. Holotype ♀, GERMANY (EAST) (IP, Eberswalde) [examined].
Ceraphron frontalis Thomson, 1858: 293. Lectotype ♀, NORWAY (NR, Stockholm), designated by Dessart (1972*a*: 184) [examined]. [Synonymized by Dessart 1972*a*: 177.]
Megaspilus laevis (Ratzeburg) Kirchner, 1867: 191.
Atritomus coccophagus Foerster, 1878: 56. Lectotype ♂, GERMANY (WEST) (MNHU, Berlin), designated by Dessart (1972*c*: 235) [examined]. [Synonymized by Dessart 1972*a*: 177.]
Ceraphron levis Dalla Torre, 1898: 526. [Unjustified emendation of *laevis* Ratzeburg.]
Atritomus levis: Kieffer, 1905: 256. [Incorrect subsequent spelling of *laevis* Ratzeburg.]
Dendrocerus levis: Kieffer, 1907: 20. [Incorrect subsequent spelling of *laevis* Ratzeburg.]
Atritomellus laevis (Ratzeburg) Kieffer, 1914: 142.
Atritomellus smirnoffi Ghesquière, 1960: 208, figs 1–3. Holotype ♂, MOROCCO: Rabat, 8.vi.1949 (*Smirnoff*) (lost). [Synonymized by Dessart, 1972*a*: 177.]
[*Lygocerus flavipes* Kieffer; Hellén, 1966: 14. Misidentification.]
Dendrocerus applanatus Dessart, 1972*a*: 59, figs 25–30. Holotype ♂, BELGIUM (IRSNB, Brussels) [examined]. **Syn. n.**
Dendrocerus laevis (Ratzeburg); Dessart, 1972*a*: 176.

FEMALE. Scape clearly longer than combined length of AII, AIII and AIV, and shorter than maximum breadth of thorax. Pedicel at least as long as AIII, normally much longer. Flagellar segments extremely short, AIV and AV approximately same length, segments AIV to AX only slightly longer than broad. Segments AII, AIII and AIV usually noticeably thinner than following segments. Flagellar segments flat ventrally; black or brown. Scape usually completely dark but occasionally considerably lighter, never with distinct light-coloured basal ring. Old specimens often uniformly light brown or yellow.

Head finely alutaceous or smooth; pubescence short; brown or black, mandible colour lighter than that of head, mandibular teeth red or brown, palps testaceous. Head relatively broad, wider than thorax; transverse when viewed anteriorly. Interantennal carina present but not developed. Groove directly behind lateral ocelli almost absent. Preoccipital crescent always present and normally strongly developed, often reaching margin of eye. Preoccipital crescent often gives apex of head, when viewed laterally, sharply angled appearance.

Thorax finely alutaceous; brown (testaceous in some faded specimens); pubescence short; not elongate (L/B 1·1–1·4). Mesonotum very short, considerably wider than long. Anterior margin of mesonotum not sharply angular. Median furrow present, notaulices not reaching posterior mesonotal margin, but fading out near bend. Mesonotum sometimes flattened dorsally, especially in central region. Secondary furrows not usually visible. Scutellum variable, often broad and shallowly arched, or narrow and almost flat; arching occasionally more pronounced. Median propodeal projection weakly developed. Propodeum sharply sloping laterally, posterior propodeal carina strongly developed. Leg coloration varies from dark black or brown on proximal segments of posterior legs to light brown or yellow on distal segments of anterior legs. Tarsal segments often slightly darker than preceding segments.

Wings clear, fringe obvious. Pterostigma often semiovoid, shape of pterostigma variable, especially in depth. Radius shallowly curved.

Gaster broad (L/B 1·2–1·9), smooth. Gastral collar short, mid lateral length less than 0·04 mm. Gastrocoeli often indistinct. Ovipositor relatively long.

Overall body length under 1·5 mm, often much smaller.

MALE. As for female except scape short, about equal to length of eye, longer than combined length of AII and AIII. Flagellar segments short (e.g., L/B for AIII 1·5–2·5). Segments AIV, AV, AVI and AVII approximately equal in length, AIII slightly larger. Flagellar pubescence very long, often as much as twice breadth of segment. Flagellum serrate, sometimes strongly serrate. Parameres short, thick, with blunt termination.

REMARKS. *D. laevis* is here recorded for the first time from Great Britain.

Dessart (1972*a*: 59) described *D. applanatus* which, apart from a flattened thorax, was 'virtually deprived of other salient characters'; he separated it from *D. laevis* by the flattened thorax, the shape of the male genitalia and the degree of development of the preoccipital crescent. Such small differences are of no more than infraspecific value. Flattening of the thorax can occur in *D. laevis* (also to a much lesser extent in *D. laticeps*) but this character and the degree of development of the preoccipital crescent are quite variable. The holotypes of *D. laevis* and *D. applanatus* are merely opposite extremes of one species.

The type-locality of *Ceraphron frontalis,* Dovre fjell, is in Norway, but many authors give the locality as being in Sweden.

D. laevis is closely related to *D. laticeps;* both are broad species with short notaulices. The elongate antennae and greater size of *D. laticeps* distinguish it from *D. laevis* but small specimens are difficult to recognize.

D. laevis has been only rarely collected but it is probably more common than the records suggest. It is one of the smallest species in the genus.

BIOLOGY. The original host record published by Ratzeburg (1852: 180) of *Cecidomyia salicina* (=probably *Rhabdophaga rosaria*) is unlikely and the true host, a coccid or an aphid, may have been overlooked.

D. laevis has been recorded from both the Coccoidea and the Aphidoidea.

Coccoidea records. Foerster (1878: 56) recorded *Atritomus coccophagus* from a coccid on *Acer.* Ghesquière (1960: 206) gave the hosts of *Atritomellus smirnoffi* from Morocco as *Eriococcus araucariae* (Eriococcidae), *Planococcus citri* and *P. longispinus* [=*adonidum*] (Pseudococcidae) via the following primary parasites, *Leptomastidea abnormis* [=*aurantiaca*] *Tetracnemus diversicornis* and *Microterys silvestrii* [?] (Chalcidoidea, Encyrtidae). *A. smirnoffi* was most common in the autumn and its life-cycle was 30–35 days. In the BMNH are 1 ♂ and 4 ♀ of *D. laevis* bred from *Heterococcus nudus* (Pseudococcidae) on *Holcus* sp. Viggiani (1970: 58) has recorded *D. laevis* as a parasite of *Pseudococcus fragilis.*

Aphidoidea records. Ivanova-Kazas (1955: 151) recorded *D. frontalis* from *Hyalopterus pruni* (=*H. arundinis*) on Spanish reed. Evenhuis (1964: 229; 1966: 39; 1968: 113) recorded *D. frontalis* from *Metopolophium albidum, Dysaphis angelicae, D. plantaginea, Aphis pomi, Rhopalosiphum insertum* and *Sitobion avenae.* In the case of *Aphis pomi* the primary parasite was *Binodoxys angelicae.* The hyperparasites generally appeared late in the season.

Dessart (1972*a*: 149, 185) questioned all the above records from aphids and considered *D. laevis* to be solely a hyperparasite of coccids. I have, however, seen specimens of *D. laevis* bred from *Aphis pomi* / *Binodoxys angelicae* / apple and *Tuberculoides annulatus* / *Trioxys pallidus* / *Quercus robur,* and Takada (1973: 7) has recorded it from *Shivaphis celti* / *Trioxys shivaphis* / *Celtis* sp.

The *Shivaphis* and *Tuberculoides* records are respectively typical of the Far Eastern and European deciduous forest faunistic complexes. All the aphids listed above are recorded from deciduous trees except *Hyalopterus pruni* on Spanish reed.

The aphids are Aphididae and Callaphididae and include gall-forming species. Apart from *Binodoxys* listed above, *Ephedrus persicae* is a likely host for *D. laevis,* as it is a parasite of *A. pomi, H. pruni* and *Dysaphis* spp.

D. laevis has been collected from May to September and the data labels of the material examined indicate that emergence is at a maximum in July and August.

MATERIAL EXAMINED

Ceraphron laevis Ratzeburg, holotype ♀, **Germany (East):** '147d laevis Rtz' (IP, Eberswalde). *Ceraphron frontalis* Thomson, lectotype ♀, **Norway:** 'alp' (*Boheman*) (NR, Stockholm). *Atritomus coccophagus* Foerster, lectotype ♂, **Germany (West):** '*Atritomus coccophagus* m, Cocc., Aceris' [no further data] (MNHU, Berlin). *Dendrocerus applanatus* Dessart, holotype ♂, **Belgium:** 'Knokhe, Fauchage prairie, 12.vii.1967' (*Dessart*) (IRSNB, Belgium).

11 ♂, 24 ♀. **Germany (West):** same data as lectotype (MNHU, Berlin) (paralectotypes of *Atritomus coccophagus Foerster*). **Great Britain.** Berkshire: Silwood Pk; Cheshire: Abbots Moss; Cumbria: Skirwith (MM, Manchester); Greater London: Acton, New Malden, Wimbledon Common; Hampshire: Heckfield Heath. **Ireland:** Wicklow, Devil's Glen. **Italy:** Duino, Triest. **Netherlands:** Bennekom; Tiel. **Sweden:** Skåne, Röstanga; Nörke, Markkärret (ZI, Lund), [label unreadable] (ZI, Lund) (paratypes of *Dendrocerus applanatus* Dessart). **Switzerland:** Geneva (IRSNB, Brussels) (allotype of *Ceraphron laevis* Ratzeburg).

FURTHER DISTRIBUTION. Finland (Hellén, 1966:15); France (Dessart, 1972*a*:185); Japan (Takada, 1973:6); Morocco (Ghesquière, 1960:208); U.S.S.R. (Ivanova-Kazas, 1955:150).

Dendrocerus laticeps (Hedicke)

(Figs 15, 26, 34, 47, 60)

Atritomellus laticeps Hedicke, 1929:60–61, figs 1, 2. Holotype ♂, GERMANY (EAST) (lost) (MNHU, Berlin). Neotype ♂, GERMANY (EAST), designated by Dessart (1972*c*:235) (MNHU, Berlin) [examined].
Lygocerus laticeps (Hedicke) Hellén, 1966:15.
Dendrocerus laticeps (Hedicke) Dessart, 1972*a*:186.

FEMALE. Scape approximately equal to combined lengths of AII, AIII and AIV, not as long as maximum breadth of thorax and broader than rest of antenna. AIII longer than AII (in female paratype nearly equal). Pedicel long. AIII long and thin, about 3 times as long as broad, distal flagellar segments broader, less elongate, with flat area ventrally. AIV sometimes slightly asymmetrical. Scape never completely dark, normally (when viewed dorsally) with distinct light-coloured basal ring, but this sometimes indistinct. Flagellum black or brown. Pubescence rather short.

Head broad; alutaceous; pubescence short; usually black, mouthparts brown or yellow, mandibular teeth red. Eyes usually large. Interantennal carina distinct and sinuate. Ocellar triangle broad and short, lateral ocelli well separated from eyes. Depression anterior to median ocellus large, lateral depressions often extended to form groove running behind ocelli. Preoccipital crescent present but weakly developed, clearly separated from margin of eye. Occipital carina strongly developed.

Thorax usually black, sometimes brown; broad (L/B 1·1–1·4). Notaulices very distinct but present only anteriorly, disappearing immediately after bend. Median furrow distinct. Axillae not strongly curved downwards. Scutellum broad, only strongly arched in small specimens. Anterior metanotal margin with conspicuous furrow passing under apex of scutellum. Propodeum posteriorly with prominent, sparsely crenulate furrow. Median propodeal projection weakly developed. Lateral thoracic segments bordered by conspicuous foveolate or crenulate furrows. Legs usually yellow, sometimes darkened proximally, especially on outside of hindlegs.

Wings clear, pubescence long, fringe long and obvious. Pterostigma noticeably semioval, long and thin. Radius evenly curved.

Gaster broad (L/B 1·2–1·8), mostly smooth. Gastral collar large with prominent carinae. Gastrocoeli visible as light or alutaceous patches.

MALE. As for female except interantennal carina and preoccipital crescent sometimes less distinct. Axillary depression less obvious. Wings slightly and legs considerably darker. Scape always longer than length of eye; alutaceous; pubescence short. Flagellum elongate (AIII long, L/B 2·4–3·0); weakly serrate (AIII almost evenly cylindrical); papillate, especially distally; pubescence long, longer than breadth of segment, except on terminal segment. Parameres long, thin and distally rounded.

REMARKS. Hedicke described this species from two males and two females, retained the holotype male and the allotype in his own collection, and donated the two other paratypes to the MNHU, Berlin. Dessart (1972*c*:235), unable to find the holotype or allotype, designated a male paratype as a neotype.

The paratypes do not agree entirely with the original description and figures as regards the length of the scape, the termination of the radius and the shape of AIII in the female; these discrepancies are nevertheless within the limits of variation of *D. laticeps*. The paratypes are lighter and slightly smaller than is normal for the species.

D. laticeps is closely related to *D. laevis;* both are broad species with short notaulices. The elongate antennae and greater size of *D. laticeps* distinguishes it from *D. laevis,* but small specimens can be difficult to identify. *D. laticeps* is unusually variable in body length, ranging between 1–2 mm. It is the most frequently collected species which has incomplete notaulices. *D. laticeps* is here recorded as British for the first time.

BIOLOGY. The original record: 2 ♀, 2 ♂, *Stenopelmus rufinasus* [Coleoptera] /–/ *Azolla filliculoides,* 25.x.–1.xi.1927 published by Hedicke (1929:59), has been strongly doubted by Dessart (1972*a*: 192; 1972*c*: 235). This single coleopterous record seems unlikely, and aphids were probably present but overlooked.

2 ♂, 3 ♀, *Acyrthosiphon nipponicus* / *Aphidius amamioshimensis* / *Paederia scandens mairei* (Takada, 1973:6); 1 ♂, Aphidiid sp. / *Aphidius* sp. / *Beta vulgaris rapa* (Takada, 1973:6); *Aphis gossypii* / *Lysiphlebia japonica* /– (Takada, 1976:237); 2 ♀, *Aphis pomi* / *Binodoxys angelicae* / *Malus sylvestris mitis,* 25.vii.1962 and 28.viii.1963; *Brevicoryne brassicae* / *Diaeretiella rapae* /– Takada, 1976:237); 1♀, *Brachycaudus helichrysi* /–/ *Chrysanthemum parthenium,* 9.vi.1915; 1 ♂, *Capitophorus* sp. *Ephedrus persicae* / *Elaeagnus umbellata* (Takada, 1973:6); *Cavariella* sp. / *Aphidius salicis* / *Selinum carvifolia,* 21.vi.1961 (Starý, 1977:3); *C. aegopodii* /–/ *Daucus* sp., 11.vi.1970 (Dessart, 1972*c*:236); *C. theobaldi* / *Aphidius salicis* / *Heracleum* sp., 16.vii.1974 (Starý, 1977:3); *Chromaphis juglandicola* / *Trioxys pallidus* / *Juglans regia,* 2.viii.1958 (Starý, 1977:3); *Coloradoa* sp. / *Lysaphidus arvensis* / *Artemisia vulgaris,* 28.vii.1960 (Starý, 1977:3); 1 ♀, *Lipaphis ?erysimi* /–/–, 22–28.x.1971; *L. erysimi* / *Diaeretiella rapae* / *Raphanus sativus* (Takada, 1973:6); 1 ♀, *Macrosiphoniella grandicauda* / *Aphidius longipetiolus* / *Artemisia* sp. (Takada, 1973:6); 1 ♂, 2 ♀, *Macrosiphum akebiae* / *Aphidius picipes* / *Oryza sativa* (Takada, 1973:6), *M. euphorbiae* /–/ *Solanum tuberosum,* 12.vi.1970 (Dessart, 1972*c*:236); 1 ♂, 1 ♀, *Microlophium carnosum* /–/ *Urtica dioica,* 25.vii.1962–28.viii.1963; 3 ♂, 8 ♀, *Myzus persicae* / *Aphidius gifuensis* / *Raphanus sativus* (Takada, 1973:6); 4 ♂, 3 ♀, *M. persicae* / *Diaeretiella rapae* / *Raphanus sativus* (Takada, 1973:6); *Periphyllus hirticornis* / *Trioxys falcatus* / *Acer campestre,* 25.vii.70 (Starý, 1977:3); 1 ♂, 1♀, *Rhopalosiphum padi* / Aphidiid sp. / *Triticum aestivum* (Takada, 1973:6); *R. padi* [*Macrosiphum padi* error?] / *Aphelinus chaonia* / *Prunus padus,* 26.ix.1968 (Dessart, 1972*c*:236); *R. padi* / *Aphelinus daucicola* / *Poa annua,* 19.x.1970 (Dessart, 1972*c*:236); *R. padi* / *Aphidius* sp. / *Poa annua,* 19.x.1970 (Dessart, 1972*c*:236); *R. padi* / *Ephedrus plagiator* / *Poa annua,* 19.x.1970 (Dessart, 1972*c*:236); *R. padi* / *Trioxys auctus* / *Poa annua* 11.x.1970 (Dessart, 1972*c*:236); 1 ♀, *Staegeriella necopinata* /–/ *Galium verum,* 7.vii.1915; *Sitobion avenae* /–/– vi.–vii.1976; 1♂, *Toxoptera odinae* / *Ephedrus plagiator* / *Pittosporum tobira* (Takada, 1973:6); 9 ♂, 14 ♀, –/ *Binodoxys sinensis* /–, 29.viii.1974; 1 ♀, –/–/ *Crataegus* sp., 3.ix.1977; 6 ♀, –/–/ *Vicia* sp., 1–9.viii.1974.

The host records *Aphis pomi, Chromaphis juglandicola* and *Periphyllus,* parasitized by *Trioxys* or *Binodoxys,* are typical of the European deciduous forest faunistic complex; the two last-mentioned aphids are the only non-Aphididae recorded. There are no conifer aphids in the host list but the Aphididae are widely represented. The Far Eastern deciduous forest faunistic complex is represented by the *Myzus persicae* / *Aphidius gifuensis* record. The *Coloradoa* sp. record is typical of the Eurasian steppe faunistic complex, although *Artemisia vulgaris* is also found in hedgerows and waste ground, etc. Several leaf curling aphids are hyperparasitized by *D. laticeps,* e.g. *Rhopalosiphum padi* / *Ephedrus plagiator.* The two *Aphelinus* (Chalcidoidea) records are from late in the year.

The plant records include trees, shrubs, herbs, crops and grasses, thus extending the field and intermediate habitat distribution recorded by Takada (1973:15). One specimen of *D. laticeps* was collected in a salt marsh.

From the material examined, July to September appears to be the time of maximum emergence.

MATERIAL EXAMINED

Atritomellus laticeps Hedicke, neotype ♂, **Germany (East):** 'Schönebecke [Elbe], aus *Stenopelm, rufinasus* 1.xi.1927' (*Manzeck*) (MNHU, Berlin).

25♂, 56♀. **China:** Foochow. **Channel Islands:** Jersey, St. Aubins. **Germany (East):** same data as neotype (MNHU, Berlin) (paratype of *Atritomellus laticeps* Hedicke). **Great Britain:** Bedfordshire: Steppingley (Chambers coll.), White Lane, Odell (Chambers coll.); Berkshire: Hamm Wood; Devon: Newton Abbot; Greater London: Battersea Fields (UM, Oxford), Coulsdon, Kew; Hertfordshire: Rothamsted (Rothamsted Exp. Stn.); Royston; Humberside: Spurn (MM, Manchester); Isles of Scilly: Bryhr; Norfolk: Foulden Common, North Wooton; Northamptonshire: Spratton; Oxfordshire: Oxford (UM, Oxford), Shotover Hill (UM, Oxford); Suffolk: Barton Mills, Santon Downham; Surrey: Dorking, Esher Common; Sussex (West): Littlehampton; no further data (UM, Oxford). **Japan:** Honshu, Niigata; Kyoto, Shimogamo. **Netherlands:** De Loete, Hazerswoude (IPO, Wageningen); Tiel.

FURTHER DISTRIBUTION. Belgium (Dessart, 1972*a*: 192); Czechoslovakia (Starý, 1977: 3); Finland (Hellén, 1966: 15); Germany (West) (Dessart, 1972*a*: 192); Sweden (Dessart, 1972*a*: 192).

Dendrocerus liebscheri Dessart

(Figs 17, 27, 42, 52, 56)

Ceraphron tenuicornis Thomson, 1858: 291. Holotype ♀, SWEDEN (ZI, Lund) [examined]. [Primary homonym of *Ceraphron tenuicornis* Boheman, 1832: 332.]
Lygocerus tenuicornis (Thomson) Dalla Torre, 1898: 535.
Dendrocerus liebscheri Dessart, 1972*a*: 193. [Replacement name for *tenuicornis* Thomson, 1858: 291.]

FEMALE. Scape long (L/B 5·0–7·0); longer than AII, AIII and AIV together; longer than head. AII nearly as long as AIII. AIII thin and relatively long (L/B 2·8–3·2). Rest of flagellar segments stout, relatively elongate, about 1·8 times longer than broad. Flagellum flat ventrally. Pubescence short and dense. Antenna papillate, completely black or at most with slightly light area at apex of AII.

Head alutaceous; pubescence short; black, mandibles black with red teeth, palps clear brown. Depression in front of median ocellus small but deep, depressions by lateral ocelli very small. Interantennal carina absent or sometimes very faintly indicated near toruli. Ocellar triangle broad, short, ocelli almost in line. Vertical furrow present from median ocellus to occipital carina. Preoccipital crescent present, not strongly developed, not reaching eyes.

Thorax approximately 1·5 times longer than broad, slightly flat in profile. Thorax black, alutaceous. Notaulices complete, sharply angled outwards anteriorly, convergent posteriorly, meeting or almost meeting median furrow at scutal suture (Fig. 17).

Median furrow not as deeply marked as notaulices. Secondary furrows often present, relatively long. Axillae strongly downcurved distally. Scutellum about 1·2 times longer than broad, central raised area strongly arched. Propodeum slightly more coarsely sculptured than rest of thorax. Central propodeal fovea normally not strongly developed. Pronotum with Y-shaped furrow but posterior arm of Y faint. Legs mostly dark, joints and tibiae yellow-brown. Wings clear, fringe present, pterostigma large, semiovoid. Radius distinctly curved (Fig. 42).

Gaster about 1·7 times longer than broad, brown or black. Collar prominent, with short carinae. Rest of gaster smooth, becoming alutaceous distally. The gastrocoeli are visible.

MALE. As for female except scape short, very stout, 3–4 times longer than broad, not as long as AII, AIII and AIV together. Segments AIII to AX similar in length but varying in breadth (e.g. L/B for AIV 1·7 and L/B for AX often over 2·5). Basal flagellar segments serrate (Fig. 52). Pubescence of scape short, pubescence of basal flagellar segments much longer than breadth of segment. Antenna sparsely papillate.

Preoccipital crescent larger, almost reaching eyes. Parameres apically broad and truncate (Fig. 27).

REMARKS. This species is similar in appearance to *D. carpenteri* but much less common. *D. liebscheri* is here recorded as British for the first time.

BIOLOGY. *Cinara laricis / Pauesia pini / Larix* sp., 15.vii.1963 (Starý, 1977: 3); *C. nuda* [*C. pini* or *C. eschlerichi* ?] *P. sp. / Pinus sylvestris* (Dessart, 1972*a*: 200); *C. pectinatae / P. infulata / Abies alba,* 23.vi.1960 and 22.vi.1974 (Starý, 1977: 3); *C. pilicornis / P.* sp. / *Picea excelsa* (Dessart, 1972*a*: 200); 1 ♂, 1 ♀, *C. pinea / P.* sp. / *Pinus sylvestris,* 18.viii.1974; 3 ♂, 9 ♀, *C. pinea /–/ Pinus sylvestris* viii.1977 [5 from 1 mummy]; 1♂, 4♀, *C. pinea /–/ Pinus sylvestris* 16.vi.1978; 2 ♂, 3 ♀, *C. juniperi /–/ Juniperus communis* 14.vii. and 1.viii.1971; *C.* sp. / *P. Pini / Pinus sylvestris* 22.vii.1959 and 13.vii.1974 (Starý, 1977: 3); *C.* sp. / *P. pini / Pinus sylvestris* (Dessart, 1972*a*: 200); *C.* sp. / *P.* sp. / *Pinus sylvestris* (Dessart, 1972*a*: 200); *Protolachnus agilis / Diaeretus leucopterus / Pinus sylvestris,* 22.vii.1959 and 13.vii.1974 (Starý, 1977: 3); *Protolachnus agilis /*

Praon bicolor / Pinus sylvestris 22.vii.1959 and 13.vii.1974 (Starý, 1977:3); *Protolachnus agilis / Praon bicolor / Pinus sylvestris* (Dessart, 1972*a*:200); *Schizolachnus pineti / Pauesia unilachni / Pinus sylvestris,* 13.vii.1974 (Starý, 1977:3); *Schizolachnus pineti / Pauesia unilachni / Pinus sylvestris* (Dessart, 1972*a*:200).

Specimens of *D. liebscheri* have been collected in June, July and August and the data indicate a peak in emergence in late July or early August. The above host records are typical of the East Eurasian coniferous forest faunistic complex and to a lesser extent of the West Eurasian coniferous complex. *D. liebscheri* has been recorded only from Aphidiinae parasitizing Lachnid aphids (Lachnidae: Cinarinae) on conifers (Pinaceae or Cupressaceae) except for two records from *Praon bicolor* (Ephedrinae). Although *Praon bicolor* is normally a deciduous forest species (Starý, 1970:314) it is, when parasitic on *Protolachnus* species, a secondary element in the West Eurasian coniferous complex. With the exception of *Praon* all the Aphidiidae listed are specialized parasites of the Lachnidae.

D. liebscheri is the only known gregarious aphid hyperparasite in *Dendrocerus*. Starý (1977:7) recorded as many as eight specimens from a single aphid mummy and I have seen five specimens from one *Cinara pinea* mummy. Both sexes were present in these series and the specimens emerged from the same exit hole in the mummy.

D. liebscheri is a specialized hyperparasite of coniferous forest aphids and although it has only been rarely collected it is probably common where it occurs.

Several of the Aphididae/Aphidiidae relationships recorded above as hosts for *D. liebscheri* are known to occur in the coniferous forests of France, West Germany, Italy and Japan, thus *D. liebscheri* may also be found in these countries.

MATERIAL EXAMINED

Ceraphron tenuicornis Thomson, holotype ♀, **Sweden:** 'Rshm [=Rysjöholm] 20.vi.1857' (ZI, Lund).

7 ♂, 17 ♀. **Germany (East):** Mirow. **Great Britain:** South Glamorgan: Cardiff; Coed-y-wenaltt; Wiltshire: Porton Blake.

FURTHER DISTRIBUTION. Czechoslovakia (Starý, 1977:3).

Dendrocerus punctipes (Boheman)

Ceraphron punctipes Boheman, 1832:332. Holotype ♀, SWEDEN (NR, Stockholm).

Ceraphron parvulum Wollaston, 1858: 26, pl. 4, fig. 8. Lectotype ♀, MADEIRA (BMNH), designated by Dessart (1972*a*:223) [examined]. [Synonymized by Dessart, 1972*a*:213.]

Conostigmus punctipes (Boheman) Kieffer, 1907: 137–138.

Dendrocerus punctipes (Boheman) Dessart, 1972*a*: 213.

FEMALE. Scape long (L/B over 4·0), slightly longer than AII, AIII and AIV together; brown, lighter brown basally; coarsely coriaceous. AIII clearly longer than AIV. Flagellum flat ventrally; brown; finely coriaceous; pubescence very short.

Head coriaceous; pubescence extremely sparse and short except on clypeus; brown or almost balck, palps colourless, mandibles brown-yellow, mandibular teeth red. Eyes large, occupying most of lateral length of head. Eye pubescence very short. Ocular suture narrow. Head rounded, not conspicuously transverse but clearly broader than thorax. Interantennal carina strongly developed, almost straight but slightly sinuate over central hump. Toruli not prominent. Frons, above interantennal carina, almost flat with two shallow depressions above toruli. Frontal dent shallow and indistinct. Depression in front of median ocellus distinct but rather shallow, the depressions in front of lateral ocelli less evident. Depressions of lateral ocelli sometimes linked by faint groove. Ocelli arranged in broad-based isosceles triangle. Preoccipital crescent almost absent, vertical furrow present, starting within ocellar triangle.

Thorax brown, alutaceous, relatively long and narrow. Pubescence short and sparse. Notaulices complete, sharply angular, converging posteriorly but not meeting median furrow. Secondary furrows visible in some specimens. Axillae only strongly curved in outer region. Scutellum broad and flat. Propodeum without any strongly projecting sculpture. Pronotum long with large crenulate furrow. Legs yellow to brown, darkest on coxae. Long hairs present at junction of coxae and thorax. Most of distal half of forewing dark brown, rarely lighter in colour. Apart from few hairs on costal vein, forewing totally without fringe. Hindwing with fringe of long hairs on posterior edge, rest of wing pubescence ultra-short. Pterostigma long and thin, approximately twice as long as broad, with blunt distal edge. Radius about as long as pterostigma. Brachypterous examples have radius shorter than pterostigma.

Gastral collar long with many distinct carinae and several long lateral hairs. Gaster slightly flat dorsally, smooth or alutaceous. Gastrocoeli clearly marked as light patches on brown gaster.

MALE. Unknown.

REMARKS. Wollaston (1958:26) described *Ceraphron parvulum* from an unspecified number of females. Masner (1965: 17) listed four female specimens of *C. parvulum,* 'one of which bears a BMNH type label'; Dessart (1972*a*: 273) designated the latter specimen as lectotype and the three others as paralectotypes.

Dendrocerus and *Conostigmus* are extremely difficult to separate and *D. punctipes* shows clear affinities with both genera. The notaulices of *D. punctipes* indicate a place in *Dendrocerus* but its flat scutellum and general appearance are similar to one group of species in *Conostigmus.* Brachypterous forms are rare in *Dendrocerus,* only occurring occasionally in *D. dubiosus* and *D. punctipes,* but are relatively common in *Conostigmus.* When the male is discovered the characteristics of its antennae should enable the generic placement of the species to be clarified. Like *D. punctipes, D. wollastoni* (Dodd) from St Helena has the forewing pubescence reduced, but the two species are definitely not conspecific. *D. punctipes* is rarely collected; it is here recorded as British for the first time

BIOLOGY. Unknown. Specimens have been collected from June to September.

MATERIAL EXAMINED

Ceraphron parvulum Wollaston, lectotype ♀, **Madeira:** '55·7' (*Wollaston*).

7 ♀. **Great Britain.** Berkshire: Windsor Forest; Devon: Torquay dist.; Surrey: Oxshott. **Madeira:** (paralectotypes of *Ceraphron parvulum Wollaston*). **Sweden:** Or. Sommarro (ZI, Lund).

FURTHER DISTRIBUTION. Algeria (Dessart, 1979:34); Finland (Hellén, 1966:19); Germany (West) (Dessart, 1972*a*:223); Norway (Dessart, 1972*a*:223).

Dendrocerus pupparum (Boheman)

(Figs 8, 29, 44, 54)

Ceraphron pupparum Boheman, 1832:333–334. Holotype ♀, SWEDEN (NR, Stockholm) [examined].

Ceraphron ancyloneurus Ratzeburg, 1844:217. Syntype(s), [GERMANY]: ex *Syrphus* larvae (Saxesen) (lost). [Synonymized by Dessart, 1972*a*: 224].

Ceraphron puparum: Thomson, 1868:292–293. [Incorrect subsequent spelling of *pupparum* Boheman.]

Lygocerus puparum (Boheman) Dalla Torre, 1898:534. [Unjustified emendation of *pupparum* Boheman.]

Lygocerus syrphidarum Kieffer, 1907:35–36. Lectotype ♀, FRANCE: 'April ex Syrphidae pupae' (*Carpentier*) (MP, Amiens), designated by Dessart (1974*b*:401). [Synonymized by Dessart, 1972*a*:224.]

Dendrocerus puparum: Dessart, 1972*a*:223. [Incorrect subsequent spelling of *pupparum* Boheman.]

FEMALE. Scape long (L/B over 4·0), nearly as long as AII, AIII and AIV together; thin in basal third and with central swelling; mostly coriaceous but also papillate. AIII longer than AII or AIV. Rest of flagellar segments short and broad (L/B 1·5–1·7), ventrally flat with longitudinal ridge and coriaceous. Antenna black or brown; yellow or light brown within antennal socket; pubescence short and dense distally but longer on three basal segments.

Head alutaceous; pubescence long, up to 0·07 mm (unusually long for this genus), eye pubescence shorter; black or dark brown, mandibles brown with red teeth, palps clear-brown; strongly transverse, in dorsal view slightly biconvex about midline. Frons behind interantennal carina with U-shaped depression (as found in *Conostigmus*) but with central hump (unlike *Conostigmus*). Hairs in this area sparse and bent outwards towards eyes. Interantennal carina incomplete; absent medially, or if complete then very weak and indistinct centrally. A groove often present behind the carina, but also absent centrally. Frontal dent large and deep (Fig. 8) with tendency to be linear. Depression in front of median ocellus deep, very close to median ocellus, sometimes slightly prolonged anteriorly. Depressions by lateral ocelli obsolescent. Ocellar triangle very broad, ocelli almost in straight line. Lateral ocelli without posterior groove. Preoccipital crescent present but poorly developed, not reaching eyes or ocelli. Vertical furrow starts as prominent depression between lateral ocelli. Occipital carina slightly prominent centrally.

Thorax alutaceous, black or dark brown, pubescence long. Mesonotum broad, anterior corners sharp, not rounded. Notaulices sharply curving outwards anteriorly; converging posteriorly; deeply impressed (median furrow not as deeply marked). Four very short secondary furrows present on mesonotum. Scutellum broad.

Transverse furrow of metanotum deep and foveolate. Propodeal carinae prominent with pronounced central ridge and fovea. Y-shaped furrow on pronotum strongly developed. Legs proximally brown, becoming light brown or yellow distally, hind coxa always brown.

Forewing with small brown area under radius. Radius very shallowly curved, almost straight. Pterostigma long and broad (L/B about 1·7), distinctively rounded (Fig. 44). Wing pubescence long, especially on costal vein, fringe absent centrally from hind margin of forewing.

Gaster brown-black, alutaceous, dorsally flat and ventrally swollen. Gastral collar broad, fluted, with short strong carinae and long lateral hairs

MALE. As for female except scape about as long as AII plus AIII. Flagellar segments not strongly serrate; strongly papillate; densely pubescent, but hairs shorter than breadth of segment; broad, AIV to AIX about twice as long as broad (Fig. 54). Radius slightly shorter than in females. Wings not coloured. Parameres long, projecting from end of gaster and distinctively expanded upwards apically (Fig. 29).

REMARKS. *D. pupparum* is probably most closely related to *D. basalis* (unrecorded in Britain) which is easily distinguished by coloration. The hind coxa of *D. basalis* females is black/brown on the proximal half and yellow on the distal half. The scape of the males is yellow.

The holotype of *Ceraphron pupparum* Boheman was labelled in error by Dessart & Sundholm as the 'lectotype of *Ceraphron puparum* Thomson'.

BIOLOGY. A parasite of Diptera, Syrphidae. Ratzeburg (1844:217) recorded *C. ancyloneurus* from *Syrphus* larvae and Kieffer (1907:36) recorded *L. syrphidarum* from a Syrphid puparium as did Dessart (1972*a*:232). Régnier (1923:174) listed *Syrphus ribesii* and *Episyrphus balteatus* (=*Syrphus balteatus*) as hosts, and Boheman (1832:333) also gave *Syrphus ribesii* (=*Scaeva ribesii*) as a host. One specimen in the BMNH was bred from an *Episyrphus balteatus* puparium. Bankowska (1975:312) recorded *D. pupparum* on *Medicago sativa.* Both the above-mentioned Syrphids are common in Britain. *D. pupparum* has been found on the following plants: *Armoracia rusticana, Crataegus oxyacanthoides, Pinus* sp. *Quercus robur* and *Sambucus niger,* and has been collected between May and September.

MATERIAL EXAMINED

Ceraphron pupparum Boheman, holotype ♀, **Sweden:** 'Sm. Bhm' [*Boheman*] 'Lectotypus *C. puparum* Thomson design. Dessart et Sundholm, 1965' (NR, Stockholm).

5 ♂, 17 ♀. **Belgium:** Kessel, Antwerp Prov. **Great Britain.** Bedfordshire; Buckinghamshire: Slough; Cambridgeshire: Ent. Fld. Lab. Storeys Way (*Varley*); Cambridge; Greater London: Kew, Wimbledon; Norfolk: Thuxton (plesiotype [?] of *Ceraphron pupparum* Boheman, designated by Dessart); Northamptonshire: Spratton.

FURTHER DISTRIBUTION. Algeria (Dessart, 1979:34); France (Kieffer, 1907:35); Finland (Hellén, 1966:14); Germany (Dessart, 1972*a*:232).

Dendrocerus ramicornis (Boheman)

(Figs 7, 31, 37, 41)

Ceraphron ramicornis Boheman, 1832:329–330. Lectotype ♂, SWEDEN (NR, Stockholm), designated by Dessart (1972*a*:243) [examined].

Ceraphron ramicornis Zetterstedt, 1838:413. Lectotype ♂, SWEDEN (NR, Stockholm), designated by Dessart (1972*a*:234, 243) [examined]. [Synonymized by Dessart, 1972*a*:234.]

Ceraphron glabriculus Thomson, 1858:291. Lectotype ♂, SWEDEN (ZI, Lund), designated by Dessart (1972*a*:234) [examined]. [Synonymized by Dessart, 1972*a*:243.]

Lygocerus ramicornis (Boheman) Marshall, 1868:158.

Lygocerus japonicus Ashmead, 1904:70. Lectotype ♀, JAPAN (USNM, Washington), designated by Masner & Muesebeck (1968:112) [examined]. [Synonymized by Takada, 1973:13.]

Lygocerus ratzeburgi Ashmead, 1904:70–71. Lectotype ♂, JAPAN (USNM, Washington), designated by Masner & Muesebeck (1968:113) [examined]. [Synonymized by Takada, 1973:13.]

Dendrocerus ramicornis (Boheman) Dessart, 1966:5.

FEMALE. Scape long and broad (L/B 4·0–6·0), about as long as AII, AIII and AIV together and much longer than eye; with median swelling and flat ventrally. AIII is longest flagellar segment although AXI can be almost as long. Flagellar segments broad (L/B 1·5–2·0), except AII and AIII (e.g. L/B for AIII 2·0–3·0).

Antenna papillate; pubescence short, much less than breadth of segment; black (or brown in some old specimens), distal end of AII and base of scape often lighter.

Head alutaceous to coriaceous; black, mandibles basally black, yellow near apex, teeth red, palps yellow; pubescence relatively long; strongly transverse. Eyes broad, almost as broad as long. Interantennal carina faintly indicated. Frontal dent and two depressions behind toruli shallow. Depressions by lateral ocelli shallow, crescent-shaped. Median ocellus preceded by small shallow depression. Ocellar triangle very broad, prominent, ocelli almost in line. Lateral ocelli joined posteriorly by groove. Preoccipital crescent strongly developed, coming close to ocelli and close to but not quite reaching margin of eye, sharply angled, especially behind ocelli. Vertical furrow present.

Thorax black (brown in old and faded specimens), alutaceous. Mesonotum broad, anterior mesonotal corners sharply angled due to deep impressions of notaulices. Notaulices complete, but sometimes less distinct posteriorly, sharply angled. Four secondary furrows visible. Scutellum broad but strongly arched. Axillae only strongly curved in outer third. Axillary depression large. Posterior propodeal carina prominent. Furrow present from top of anterior mesepisternal boundary to episternal scrobe. Short trace present of smooth straight precoxal sulcus. Legs mostly light brown, coxae brown-black, often smooth and shiny or weakly alutaceous.

Wings clear. Hindwing with distinct anal lobe (Fig. 37) but indentation of vannal fold smooth and rounded. Pterostigma rounded, radius clearly angled.

Gaster broad but sometimes rather short; flattened dorsally and convex ventrally; smooth or alutaceous; dark brown. Gastrocoeli unusually broad but only faintly indicated as light brown patches. Gastral collar well developed.

A large species, body length 2·1–2·8 mm.

MALE. As for female except scape black; short, about three times longer than broad. AII, AIII, and AIV very short, AVIII longest segment. AIII to AVII each with long projection, longer than segment (Fig. 31). AVIII with small hump, AX and AXI cylindrical. Projection on AVII longer than segment AVIII. Pubescence long. Gaster slightly less broad than in female. Parameres broad with long hairs.

REMARKS. The antennae of *D. ramicornis* males (Fig. 31) are obviously similar to those of *D. halidayi* (Fig. 32), but the former is a darker and larger species.

D. ramicornis Boheman, 1832 was also described as new by Zetterstedt (1838:413). Dessart (1972*a*:234, 243) has treated them as two synonymous species and designated a lectotype for each.

BIOLOGY. 1 ♂, *Cinara* sp. / *Pauesia* sp. / *Abies firma* (Takada, 1973: 14); 1 ♂, 2 ♀, *Cinara* sp. / *Pauesia* sp. / *Chamaecyparis pisifirma* (Takada, 1973: 14); 1 ♂, 1♀, *Cinara* sp. / *Pauesia momicola* / *Abies firma* (Takada, 1973: 14); 1 ♂, *C. laricis* / *P. pini* / *Larix leptolepis* (Takada, 1973: 14); 3 ♀, *C. longipennis* / *P. konoi* / *Abies firma* (Takada, 1973: 14); 1 ♂, *C. pilicornis* / *P. abietis* /–; 4 ♂, 4 ♀, *C. pinea* /–/ *Pinus sylvestris*; 13 ♂, 25 ♀, *C. pineti* / *P. abietis* / *Pinus densiflora* (Takada, 1973: 14); 3 ♂, *Lachniella costata* / *Pauesia jezoensis* / *Picea jezoensis* (Takada, 1973: 14); 2 ♂, 2 ♀, *Lachnus tropicalis* / *Pauesia japonica* / *Quercus* sp. (Takada, 1973: 14); 2 ♀, *Lachnus* sp. /–/ *Pinus* sp. (Ashmead, 1904: 70); [?] *Pineus pini* /–/– (Hellén, 1966: 11); *Protolachnus thunbergii* / *Diaeretus leucopterus* / *Pinus thunbergii* (Takada, 1973: 14); 5 ♂, *Schizolachnus* sp. / *P. unilachni* / *Pinus densiflora* (Takada, 1973: 14); *Tuberolachnus salignus* / *Euneura nawai* /– (Yasumatsu et al. 1946: 12); *Tuberolachnus salignus* / *Pauesia salignae* /– (Yasumatsu et al. 1946: 12).

The above records are of Aphidoidea: Cinarinae in association with Eurasian coniferous forest and Aphidoidea: Lachninae in association with deciduous forest, thus the host preference of *D ramicornis* is linked to the Lachnidae rather than the host plant. The *Pineus pini* record seems unlikely as this is the only record from the Adelgidae: also this is a very small aphid compared with the other hosts and *D. ramicornis* is a large species. Ashmead (1904: 71) recorded *D. ramicornis* (as *ratzeburgi*) from '*Aphis*' but elsewhere he used this to mean just aphid. Yasumatsu et al. (1946: 12) indicated that *D. ramicornis* (as *ratzeburgi* and *japonicus*) could be a tertiary parasite of *Tuberolachnus salignus* via Aphidiidae and Chalcidoidea.

From the material examined *D. ramicornis* seems to be most common in July.

MATERIAL EXAMINED

Ceraphron ramicornis Boheman, lectotype ♂, **Sweden:** 'Sc. Bhn.' [Scania (*Boheman*)] (NR, Stockholm), *Ceraphron ramicornis* Zetterstedt, lectotype ♂, **Sweden:** Kengis (NR, Stockholm). *Ceraphron glabriculus* Thomson, lectotype ♂, **Sweden:** 'Rhn' (ZI, Lund). *Lygocerus japonicus* Ashmead, lectotype ♀, **Japan:** Atami

(*Koebele*) (USNM, Washington). *Lygocerus ratzeburgi* Ashmead, lectotype ♂, **Japan:** (*Koebele*) (USNM, Washington).

12 ♂, 9 ♀. **Germany (West):** Würbenthal. **Great Britain.** Buckinghamshire: Soulbury, Rammamere Heath; Hampshire: New Forest; Highland: Caledonian Forest, Glen Afric; Strathclyde: Beinn Eigh; Surrey: Esher Common. **Japan:** Honshu, Kobe; Honshu, Kyoto; no further data (paralectotype of *Lygocerus ratzeburgi* Ashmead) (USNM, Washington). **Netherlands:** Wageningen. **Spain:** Castellon, Benicasim. **Sweden:** Gtl, Ostergarn, Vike (ZI. Lund); [label illegible] (ZI, Lund).

FURTHER DISTRIBUTION. Finland (Hellén, (1966: 11).

Dendrocerus serricornis (Boheman)

(Figs 43, 53)

Ceraphron serricornis Boheman, 1832: 334–335. Holotype ♂, SWEDEN (ZI, Lund) [examined].

Ceraphron serricornis Zetterstedt, 1838: 413. Holotype ♂, SWEDEN (ZI, Lund) [examined, same specimen as above]. [Synonymized by Dessart, 1972*a*: 253.]

Ceraphron piceae Ratzeburg, 1852: 179. Syntype(s), GERMANY (lost). [Synonymized by Dessart, 1972*a*: 253.]

Ceraphron lapponicus Thomson, 1858: 290. Holotype ♀, SWEDEN (NR, Stockholm) [examined]. [Synonymized by Dessart, 1972*a*: 253.]

Lygocerus serricornis (Boheman) Marshall, 1868: 158.

Lygocerus semiramosus Kieffer, 1907:38. Lectotype ♂, GREAT BRITAIN (BMNH), designated by Masner (1965: 21) [examined]. **Syn. n.**

Lygocerus subramosus Kieffer, 1907: 39. Syntype(s), FRANCE (lost). [Synonymized by Dessart, 1972*a*: 253.]

[*Lygocerus testaceimanus* Kieffer; Wilson, 1938: 378. Misidentification.]

Atritomellus zetterstedti Ghesquière, 1960: 208. [Replacement name for *Ceraphron serricornis* Zetterstedt, 1838.] [Synonymized by Dessart, 1972*a*: 253.]

Ceraphron serraticornis: Ghesquière, 1960: 208. [Incorrect subsequent spelling of *serricornis* Zetterstedt.]

Dendrocerus serricornis (Boheman) Dessart, 1966: 13.

FEMALE. Scape short (L/B 4·0–4·5), slightly shorter than length of head; longer than AII, AIII and AIV together. In small specimens antennal segments very short and scape often longer than next four segments together. AII about as long as AIII and often longer than AIV. AIII longer than any of following basal segments which are stout (roughly 1·5 times longer than broad). Antenna black except for distal end of AII, which is lighter. Scape coriaceous to papillate, flagellum weakly papillate, pubescence short and dense.

Head coriaceous or alutaceous; pubescence not long but quite noticeable, clypeal hairs long, eye pubescence short; black, mandibles brown with red-brown teeth, palps clear-yellow; rounded (especially in dorsal view), less transverse than in many species of *Dendrocerus*. Interantennal carina variable, sometimes almost absent or just complete, but usually present near toruli and absent over median hump. Depressions behind and inwards from each torulus united to form large, slightly depressed area above interantennal carina. Median hump between toruli gives this depression an appearance similar to the stronger, horseshoe-shaped depression found in some *Conostigmus* species. Frontal dent absent. Depressions near ocelli usually shallow but median depression often deeper in large specimens. Ocellar triangle broad, very short. Lateral ocellar depressions sometimes linked by groove. Vertical furrow present on preoccipital crescent. Preoccipital crescent very strongly developed, reaching ocelli and margin of eye; abruptly angled downwards from vertex. Occipital carina foveolate.

Thorax black (or dark brown in old specimens); often long and narrow, 1·4–1·8 times longer than broad. Anterior corners of mesonotum rounded. In lateral view mesonotum swollen anteriorly; this may be enhanced by a backward slant of pronotum and propleuron. Notaulices complete, four secondary furrows usually distinct. Notaulices very strongly angled anteriorly, almost straight posteriorly except for last fraction where they curve towards midline. Scutellum rather narrow, raised region about 1·4 times longer than wide, clearly arched but sometimes slightly flat dorsally. Metanotal furrow strongly foveolate or canaliculate. Propodeum coriaceous to rugose, appreciably more coarsely sculptured than rest of dorsal surface of thorax. Propodeal fovea not prominent. Pleural suture foveolate, episternal scrobe distinct. Legs black-brown, lighter or clear brown on tibia and tarsus (especially of forelegs). Wings clear, pubescence normal. Radius well curved, about 1·3 times longer than pterostigma. Pterostigma characteristically shaped (Fig. 43), about 1·5 times longer than broad.

Gaster 1·5–2·0 times longer than broad. Gastral collar large with distinct carinae. Gaster mostly smooth or finely alutaceous, gastrocoeli visible. Gaster lighter brown anteriorly, dark brown posteriorly.

MALE. As for female except scape very short, much less than length of head and not as long as combined length of AII, AIII and AIV. Basal flagellar segments strongly serrate (Fig. 53), AIII characteristically shaped, 1·0–1·5 times longer than broad. AIV as long as broad (L/B 0·9–1·2). Flagellar pubescence much longer than breadth of segment. Depression behind interantennal carina less obvious, head more transverse and thorax less rounded than in female.

REMARKS. *D. serricornis* Boheman, 1832 was also described as new by Zetterstedt (1838:413). Dessart (1972*a*:253, 261) has treated them as two synonymous species having the same holotype.

The specimens misidentified by Wilson (1938:378) as *Lygocerus testaceimanus* are in the BMNH and are *D. serricornis,* as Dessart (1972*a*:254) suspected.

D. serricornis is recognizable by the shape of the male antenna, head and thorax, but females of this species and *D. carpenteri* are sometimes hard to distinguish. The basal flagellar segments of *D. serricornis* males are more strongly serrate than in other British species (except those with ramose antennae, i.e. *D. halidayi,* Fig. 32 and *D. ramicornis,* Fig. 31).

BIOLOGY. Host information indicates that *D. serricornis* is chiefly a parasite of Chamaemyiidae (Diptera) which prey on Adelgidae (Hemiptera).

Wilson (1938:378) reared *D. serricornis* (as *Lygocerus testaceimanus*) from pupae of *Leucopis obscura* (Diptera: Chamaemyiidae) which were preying upon the Adelgids *Pineus pini* (on *Pinus sylvestris*) and *P. strobi* (on *Pinus strobus*). *D. serricornis* can subsequently emerge from the pupae (collected in July) or can diapause and emerge in the following May. *Melanips longitarsis* (Hymenoptera, Cynipoidea) and *Aphidencyrtus aphidivorus* (Hymenoptera, Chalcidoidea) were also parasitic on *L. obscura* but *D. serricornis* was the most common parasite. These three parasites seem to be most efficient as Wilson states that 'all the *L. obscura* puparia present in the field from late summer to late winter are parasitized specimens'. In addition to Wilson's records, I have seen a specimen of *D. serricornis* bred from a *Leucopis* sp. puparium found on *Fagus sylvatica.*

Schremmer (1956:58) recorded *D. serricornis* (as *Lygocerus piceae*) as a parasite of *Cremifania nigrocellulata* (Diptera: Chamaemyiidae) which was preying on *Adelges* (*Dreyfusia*) *piceae* (Hemiptera, Adelgidae). Delucchi & Pschorn-Walcher (1954:102) recorded *D. serricornis (=piceae)* as a parasite of the 3rd larval stage of *Cremifania nigrocellulata. Pachyneuron vitodurense* (=*P. ferrierei* Delucchi) and *P. cremifaniae* (Chalcidoidea, Pteromalidae) were given as parasites of the puparia of *Cremifania. D. serricornis* and *P. vitodurense* were also listed as parasites of *Leucopis obscura* and *L. griseola.* These *Leucopis* species and *Cremifania nigrocellulata* are all predators on related Adelgids. Ratzeburg (1848:216) recorded *D. serricornis* (as *piceae*) from *Adelges piceae* (*Chermes piceae*).

According to Starý (1970:200) no Aphidiidae have been recorded as primary parasites of Adelgids; if *D. serricornis* is a hyperparasite then it is likely to be via Chalcids, like those mentioned above.

D. serricornis is known from other hosts. Lal (1934:328) recorded *L. semiramosus* as 'believed to be' a hyperparasite of *Prionomitus mitratus* (Chalcidoidea, Encyrtidae) which was in turn a primary parasite of *Psylla peregrina* on *Crataegus.* This chalcid has also been listed as a parasite of other *Psylla* species. The hyperparasites appeared in mid September. One nymph contained three recently hatched *Dendrocerus* larvae. Lal presumed that the *Dendrocerus* 'were acting as tertiary parasites of a secondary parasite, or of their own species'. Haviland (1920*b*: 103) recorded a similar case. The egg of *serricornis* is long and elliptical, 0·67 × 0·28 mm, the surface sculptured with fine longitudinal striae. The larva, which emerges through an operculum at the end of the egg, is small, creamy white, and measures 0·45 × 0·15 mm.

A male and female of *D. serricornis* in the BMNH were bred from second instars of *Parthenolecanium corni* (Coccoidea) on *Corylus avellana. D. serricornis* has been found on the following plants: *Crataegus, Humulus lupulus, Populus nigra italica* and *Pinus* sp. With the exception of hop all the plant records are of trees or shrubs, and many of the trees are conifers.

Kieffer (1907:39) recorded *L. subramosus* from *Cecidomyia pini* (Diptera, Cecidomyiidae).

From the material examined *D. serricornis* seems to be most common in late July.

MATERIAL EXAMINED

Ceraphron serricornis Boheman and *Ceraphron serricornis* Zetterstedt, holotype ♂ [of both nominal taxa], **Sweden:** 'Joh No' (ZI, Lund). *Ceraphron lapponicus* Thomson, holotype ♀, **Sweden:** Lappland (*Boheman*) (NR, Stockholm). *Lygocerus semiramosus* Kieffer, lectotype ♂, **Great Britain:** 'Cad' [Strathclyde, Cadder] (Cameron) (BMNH).

35 ♂, 13 ♀, **Great Britain.** Bedfordshire (Chambers coll.); Buckinghamshire: Farnham House; Cheshire: Delamere (MM, Manchester); Cumbria: Skirwith (MM, Manchester); Grampian: Elgin; Greater London: Kew; Hertfordshire: Tring; Kent: Barnehurst, East Malling, Eynsford; Norfolk: North Wooton; Northamptonshire: Spratton; North Yorkshire: Malham Tarn (NM, Manchester); Oxfordshire: Oxford; Suffolk: Santon Downham, Barton Mills; Wiltshire: Corsham. **Ireland:** Co. Dublin, Grand Canal; Leitrim; Co. Wicklow, Killegar. **Japan:** Atami (paralectotype of *Lygocerus koebelei*) (USNM, Washington). **Spain:** Valencia, El Perelló. **Sweden:** Skane, Ring; Ör (ZI, Lund).

FURTHER DISTRIBUTION. Finland (Hellén, 1966:11); France (Dessart, 1972*a*:266); Germany (Dessart, 1972*a*:266).

Dendrocerus spissicornis (Hellén)

(Fig. 19)

Lygocerus spissicornis Hellén, 1966: 12. Holotype ♀, FINLAND, (ZMU, Helsinki) [examined].
Dendrocerus spissicornis (Hellén) Dessart, 1972*a*:274–281.

FEMALE. Scape short and broad (L/B 3·6–5·0), thinner at base than apex, slightly longer than AII, AIII and AIV together; colour varying from entirely dark to orange-yellow, often lighter basally. AIII thinner (L/B 1·4 or greater) than AIV to AX, which are quadrate. AII and proximal part of AIII often orange-yellow, rest of flagellum brown. Antennal insertion orange-yellow. Flagellar segments flat ventrally with single central ridge. Antenna papillate with dense pubescence.

Head sculpture mostly rugose, large depression above interantennal carina sometimes weakly sculptured but usually strongly strigose. Eye margin smooth. Head black, palps yellow or orange. Mandibles basally black, yellow or orange medially, with red-black teeth. Toruli very short, especially internally. Interantennal carina distinct, often slightly sinuate centrally over small hump. Large depression present above toruli. Depression in front of median ocellus deep and distinct. Depressions near lateral ocelli linear and not joined by ridge running behind ocelli. Preoccipital crescent strongly developed but not quite reaching margin of eye or lateral ocelli, with central vertical furrow. Last segment of maxillary palps much longer than penultimate segment. Hair round mandibles and on clypeus longer than on rest of head.

Thorax black, strongly sculptured, granulate, punctate and rugose; all furrows deeply foveolate. Mesonotum and scutellum flattened but central area between notaulices slightly raised anteriorly. Mesonotum with notaulices complete, reaching posterior margin and meeting median furrow. Notaulices not deeply curved. Secondary furrows evident. Scutellum broad, very flat, with transverse carina apically. Narrow band of strigose sculpture present running parallel to edge of scutellum from axillae to transverse carina. Metanotum reduced, obscured by large bilobed transverse keel situated in middle of propodeum. Femora brown, or black in fresh specimens, tibiae and tarsae lighter.

Wings almost clear but with feeble brown mark around radius; however, one old specimen (c. 1826) has distinct brown cloud under radius. Pterostigma semioval, radius approximately as long as breadth of pterostigma. Fringe short and fine.

Gastral collar broad, very short. Entire breadth of gaster covered by area of strigose sculpture radiating from gastral collar and nearly reaching gastrocoeli (Fig. 19). Rest of gaster smooth or alutaceous.

MALE. As for female except scape longer than segments AII, AIII and AIV together, just over 3 times as long as broad. AII shorter than AIII. AIII about 1·5 times longer than broad. AIV and AV as long as broad. Rest of flagellar segments progressively less broad, AXI being 3 times longer than broad. Basal flagellar segments clearly asymmetrical, especially segments AIV to AVII. Antenna brown except for AII and small light area at base of scape; papillate; with dense pubescence shorter than breadth of segment.

REMARKS. *D. spissicornis* is here recorded as British for the first time. It is generally more grossly sculptured than is usual in *Dendrocerus,* also the notaulices are not as deeply curved as they are in other species of the genus. *D. spissicornis* is rare, at least in collections.

BIOLOGY. Dessart (1972*a*:281) has seen two specimens of *D. spissicornis* for which the puparia of Cyclorrhapha (Diptera) are indicated as hosts. Half of the British specimens so far known were collected on dead beech or oak trees. Dates of collection range from late June to early September.

MATERIAL EXAMINED

Lygocerus spissicornis Hellén, holotype ♀, **Finland:** Nystad (*Hellén*) (ZMU, Helsinki).

1 ♂, 11 ♀. **Great Britain.** Buckinghamshire: Shabbington Wood, nr Oakley; Cheshire: Abbots Moss (MM, Manchester), Rostherne; Hampshire: W. of Winchester, Crab Wood; Surrey: Woodcote (MM, Manchester); no further data (UM, Oxford). **Sweden:** [label illegible,] (ZI, Lund); Upl. Vallentuna (NR, Stockholm) (male allotype).

FURTHER DISTRIBUTION. Belgium (Dessart, 1972*a*:281); France (Dessart, 1972*a*:281).

Review of the biology of *Dendrocerus*

The host records for the British species of *Dendrocerus* are here listed under host classification. The basic host relationships of *Dendrocerus* are summarized in tabular form. The biology of the British species is associated mostly with the Homoptera Sternorhyncha and is typical of the genus as a whole. The faunistic complexes used in this work are briefly defined.

Host aphid list for *Dendrocerus* species

Host	*Dendrocerus* species
APHIDOIDEA	
LACHNIDAE	
Cinarinae	
Protolachnus	*carpenteri, liebscheri, ramicornis*
Schizolachnus	*carpenteri, dubiosus, liebscheri, ramicornis*
Cinara	*carpenteri, liebscheri, ramicornis*
Lachniella	*ramicornis*
Lachninae	
Lachnini	
Tuberolachnus	*carpenteri, ramicornis*
Lachnus	*ramicornis*
CHAITOPHORIDAE	
Chaitophorinae	
Periphyllus	*carpenteri, laticeps*
Parachaitophorus	*carpenteri*
Siphinae	
Sipha	*aphidum, carpenteri*
CALLAPHIDIDAE	
Callaphidinae	
Callaphidini	
Chromaphis	*laticeps*
Myzocallidini	
Myzocallis	*carpenteri*
Tuberculoides	*carpenteri, laevis*
Eucallipterus	*aphidum, carpenteri*
Tinocallis	*carpenteri*
Shivaphis	*laevis*
Pterocallis	*carpenteri*
Phyllaphidinae	
Phyllaphidini	
Callipterinella	*carpenteri*
Betulaphis	*carpenteri*
Symydobius	*carpenteri*
Clethrobius	*aphidum*
Euceraphis	*carpenteri*
Parachaitophorus	*carpenteri*
Drepanosiphini	
Drepanosiphum	*carpenteri*

Therioaphidinae	
Therioaphis	*dubiosus*
Neophyllaphidinae	
Neophyllaphis	*carpenteri*
APHIDIDAE	
Pterocommatinae	
Pterocomma	*carpenteri*
Aphidinae	
Hyalopterus	*aphidum, carpenteri, laevis*
Rhopalosiphum	*aphidum, carpenteri, laevis, laticeps*
Schizaphis	*aphidum, carpenteri, laevis*
Paraschizaphis	*aphidum, bifoveatus*
Melanaphis	*carpenteri*
Aphis	*aphidum, bifoveatus, carpenteri, dubiosus, laevis, laticeps*
Toxoptera	*carpenteri, laticeps*
Myzinae	
Cryptosiphum	*dubiosus*
Ceruraphis	*carpenteri*
Dysaphis	*carpenteri, laevis*
Brachycaudus	*aphidum, carpenteri, laticeps*
Diuraphis	*aphidum, carpenteri*
Hayhurstia	*carpenteri*
Brevicoryne	*carpenteri, laticeps*
Pseudobrevicoryne	*carpenteri*
Lipaphis	*carpenteri, laticeps*
Hyadaphis	*carpenteri*
Staegeriella	*?laticeps*
Toxopterella	*carpenteri*
Hyalopteroides	*dubiosus*
Coloradoa	*carpenteri, laticeps*
Myzaphis	*carpenteri*
Chaetosiphon	*carpenteri*
Elatobium	*carpenteri*
Liosomaphis	*aphidum, carpenteri*
Cavariella	*aphidum, carpenteri, laticeps*
Ovatus	*carpenteri*
Phorodon	*carpenteri*
Rhopalomyzus	*carpenteri*
Myzus	*aphidum, carpenteri, laticeps*
Galiobium	*dubiosus*
Tuberocephalus	*carpenteri*
Cryptomyzus	*carpenteri*
Capitophorus	*carpenteri, laticeps*
Pleotrichophorus	*carpenteri*
Nasonovia	*carpenteri*
Hyperomyzus	*carpenteri*
Rhopalosiphoninus	*bifoveatus, carpenteri, dubiosus*
Indomegoura	*carpenteri*
Macrosiphinae	
Microlophium	*aphidum, carpenteri, dubiosus, laticeps*
Aulacorthum	*carpenteri, dubiosus*
Acyrthosiphon	*aphidum, bifoveatus, carpenteri, dubiosus, laticeps*
Metopolophium	*aphidum, carpenteri, laevis*
Corylobium	*carpenteri*
Staticobium	*carpenteri*

Macrosiphum	*carpenteri, dubiosus, laticeps*
Sitobion	*aphidum, carpenteri, dubiosus, laevis, laticeps*
Titanosiphon	*carpenteri*
Metopeurum	*carpenteri*
Uroleucon	*aphidum, carpenteri, dubiosus*
Macrosiphoniella	*aphidum, carpenteri, laticeps*
Amphorophora	*carpenteri*
THELAXIDAE	
Thelaxinae	
Mindarus	*carpenteri*
Hormaphidinae	
Hamamelistes	*carpenteri*
PEMPHIGIDAE	
Eriosomatinae	*—
Pemphiginae	
Prociphilus	*carpenteri*
ADELGIDAE	*serricornis*
Pineinae	
Pineus	? *ramicornis, serricornis*
Adelginae	
Adelges	*serricornis*

* Starý (1977:4) recorded *Dendrocerus* sp. from *Eriosoma ulmi* but the specimens have not been made available for identification.

List of the Aphidiidae (Hymenoptera) parasitized by *Dendrocerus*

Host	*Dendrocerus* species
APHIDIIDAE	
Ephedrinae	
Ephedrus californicus	*carpenteri*
E. lacertosus	*carpenteri*
E. minor	*carpenteri*
E. nacheri	*carpenteri, dubiosus*
E. niger	*carpenteri, dubiosus*
E. persicae	*aphidum, carpenteri, laticeps*
E. plagiator	*aphidum, carpenteri, dubiosus, laticeps*
E. salicicola	*carpenteri*
E. sp.	*aphidum, carpenteri, dubiosus*
Prainae	
Areopraon nipponicum	*carpenteri*
Praon abjectum	*aphidum, carpenteri*
P. absinthii	*carpenteri*
P. barbatum	*carpenteri*
P. bicolor	*carpenteri, liebscheri*
P. capitophori	*carpenteri*
P. dorsale	*carpenteri, dubiosus*
P. exsoletum	*dubiosus*
P. flavinode	*carpenteri*
P. gallicum	*carpenteri*
P. necans	*aphidum, carpenteri*
P. pequodorum	*carpenteri*
P. silvestre	*carpenteri*
P. volucre	*aphidum, carpenteri, dubiosus*
P. sp.	*aphidum, carpenteri, dubiosus*
Dyscritulus planiceps	*carpenteri*
D. sp.	*carpenteri*

Aphidiinae	
Aphidiini	
Lysiphlebus ambiguus	*carpenteri*
L. arvicola	*carpenteri*
L. dissolutus	*carpenteri*
L. fabarum	*carpenteri, dubiosus*
L. fritzmuelleri	*carpenteri*
L. testaceipes	*carpenteri*
Lysiphlebia japonica	*carpenteri, laticeps*
Pauesia abietis	*carpenteri, ramicornis*
P. akamatsucola	*carpenteri*
P. infulata	*liebscheri*
P. japonica	*ramicornis*
P. jezoensis	*ramicornis*
P. konoi	*ramicornis*
P. laricis	*carpenteri*
P. momicola	*ramicornis*
P. piceaecollis	*carpenteri*
P. pini	*carpenteri, liebscheri, ramicornis*
P. salignae	*carpenteri, ramicornis*
P. unilachni	*carpenteri, dubiosus, liebscheri, ramicornis*
P. sp.	*carpenteri, liebscheri, ramicornis*
Metaphidius aterrimus	*carpenteri*
Diaeretus leucopterus	*carpenteri, liebscheri, ramicornis*
Aphidius absinthii	*carpenteri*
A. amamioshimensis	*laticeps*
A. aquilus	*carpenteri*
A. areolatus	*carpenteri*
A. cingulatus	*carpenteri*
A. equiseticola	*carpenteri, dubiosus*
A. ervi	*aphidum, carpenteri, dubiosus*
A. funebris	*carpenteri*
A. gifuensis	*carpenteri, laticeps*
A. hieraciorum	*carpenteri*
A. hortensis	*carpenteri*
A. longipetiolus	*carpenteri, laticeps*
A. matricariae	*carpenteri, dubiosus*
A. phalangomyzi	*carpenteri*
A. picipes	*aphidum, carpenteri, dubiosus, laticeps*
A. platensis	*aphidum*
A. polygonaphis	*carpenteri*
A. rosae	*carpenteri, dubiosus*
A. salicis	*carpenteri, laticeps*
A. schimitscheki	*carpenteri*
A. setiger	*carpenteri*
A. smithi	*carpenteri*
A. sonchi	*aphidum*
A. tanacetarius	*carpenteri*
A. urticae	*bifoveatus, carpenteri*
A. uzbekistanicus	*aphidum, carpenteri, dubiosus*
A. sp.	*aphidum, carpenteri, dubiosus, laticeps*
Lysaphidus arvensis	*laticeps*
L. erysimi	*carpenteri*
L. matsuyamensis	*carpenteri*
L. pleotrichophori	*carpenteri*
Diaeretiella rapae	*aphidum, bifoveatus, carpenteri, dubiosus, laticeps*

Trioxini	
Monoctonus angustivalvus	*carpenteri*
M. caricis	*dubiosus*
M. cerasi	*carpenteri*
M. pseudoplatani	*carpenteri*
Lipolexis gracilis	*carpenteri*
Calaphidius watanabei	*carpenteri*
Trioxys auctus	*laticeps*
T. betulae	*aphidum, carpenteri*
T. cirsii	*carpenteri*
T. curvicaudus	*carpenteri*
T. euceraphis	*carpenteri*
T. falcatus	*carpenteri, laticeps*
T. pallidus	*carpenteri, laevis, laticeps*
T. pannonicus	*carpenteri*
T. parauctus	*carpenteri*
T. shivaphis	*laevis*
Binodoxys acalephae	*aphidum, carpenteri, dubiosus*
B. angelicae	*carpenteri, dubiosus, laevis, laticeps*
B. brevicornis	*carpenteri*
B. centaureae	*carpenteri*
B. sinensis	*laticeps*

Starý (1977:5) recorded an unidentified species of *Dendrocerus* from *Areopraon lepelleyi*.

Other hosts

Host	*Dendrocerus* species
HEMIPTERA	
HOMOPTERA	
PSYLLOIDEA	
Psylla peregrina	*serricornis*
COCCOIDEA	
Coccidae	
Parthenolecanium corni	*serricornis*
Eriococcidae	
Eriococcus araucariae	*laevis*
Pseudococcidae	
Heterococcus nudus	*laevis*
Planococcus citri	*laevis*
P. longispinus	*laevis*
Pseudococcus fragilis	*laevis*
NEUROPTERA	
SIALOIDEA	
Coniopterygidae	
Conwentzia psociformis	*halidayi*
Semiadalis aleyrodiformis	*halidayi*
Coniopteryx esbenpeterseni	*flavipes*
Chrysopidae	
Chrysopa virgestes	? *aphidum*
COLEOPTERA	
Curculionidae	
Erirhininae	
Stenopelmus rufinasus	? *laticeps*
DIPTERA	? *aphidum*

NEMATOCERA	
Cecidomyiidae	
Rhabdophaga rosaria	? *laevis*
Cecidomyia pini	*serricornis*
CYCLORRHAPHA	
Syrphidae	
Syrphus ribesii	*pupparum*
S. sp.	*pupparum*
Episyrphus balteatus	*pupparum*
Chamaemyiidae	
Leucopis griseola	*serricornis*
L. obscura	*serricornis*
L. sp.	*serricornis*
Cremifania nigrocellulata	*serricornis*
Chloropidae	
Meromyza saltatrix	*carpenteri*
HYMENOPTERA	
FORMICOIDEA	
Formica rufa	*carpenteri*
Lasius brunneus	*dubiosus*
L. fuliginosus	*carpenteri*
CYNIPOIDEA	
Alloxystinae	
Phaenoglyphis sp.	*carpenteri*
Alloxysta brassicae	*carpenteri*
A. victrix	*carpenteri*
A. sp.	*carpenteri*
Figitidae	
Melanips longitarsis	? *serricornis*
Cynipidae	
Gall of *Biorhiza pallida*	*halidayi*
Gall of *Diplolepis rosae*	*carpenteri*
CHALCIDOIDEA	
Aphelinidae	
Aphelinus abdominalis	*carpenteri*
A. chaonia	*laticeps*
A. daucicola	*laticeps*
Encyrtidae	
Leptomastidea abnormis	*laevis*
Tetracnemus diversicornis	*laevis*
Microterys sp.	*laevis*
Aphidencyrtus aphidivorus	*carpenteri*, ? *serricornis*
Prionomitus mitratus	*serricornis*
Encyrtus sp.	*carpenteri*
Pteromalidae	
Asaphes lucens	*carpenteri*
A. suspensus	*carpenteri*
A. vulgaris	*carpenteri*
Cyrtogaster vulgaris	*carpenteri*
Pachyneuron aphidis	*carpenteri*
P. cremifaniae	*serricornis*
P. siphonophorae	*carpenteri*
P. vitodurense	*serricornis*
Euneura nawai	*ramicornis*
Coruna clavata	*carpenteri*

Occasional fortuitous plant records may result from parasitized aphids moving from their normal host plant before becoming mummified.

The host lists show that the British species of *Dendrocerus* are mostly aphid hyperparasites, but

Dendrocerus species	Host Diptera	Host Neuroptera	Host Coccoidea	Host Aphidoidea	Host Aphidiidae	Biotope
aphidum				various genera but not Lachnidae	various genera	steppe, deciduous forest, Holarctic forest tundra, boreal, wet habitats, crops etc.
bifoveatus				various Aphididae	Aphidiini	wet habitats
carpenteri				most genera	most genera	most habitats: steppe, deciduous and coniferous forest, Holarctic forest tundra, crops etc.
dubiosus				various genera	many genera	steppe, deciduous and coniferous forest, waste land etc.
flavipes		Coniopterygidae				
halidayi		Coniopterygidae				
laevis			Eriococcidae and Pseudococcidae	Aphididae and Callaphididae	Trioxini	deciduous forest
laticeps				various aphids but not Lachnidae	various genera	deciduous forest, steppe and salt marsh
liebscheri				exclusively on Lachnidae	Prainae and Aphidiini	coniferous forest
punctipes	?	?	?	?	?	?
pupparum	Syrphidae					
ramicornis				Lachnidae	Aphidiini	coniferous and deciduous forest
serricornis	Chamaemyiidae Cecidomyiidae		*Parthenolecanium*			trees and shrubs
spissicornis	? Cyclorrhapha					dead deciduous trees

Table 1 Summary of host relationships

some are parasitic on Diptera, some on Neuroptera and *D. laevis* is parasitic on coccids as well as aphids. The biology of *Dendrocerus* is clearly very closely related to the Homoptera-Sternorhyncha (i.e. Psylloidea, Aleyrodoidea, Aphidoidea and Coccoidea), and even the hosts listed from other groups are often predators on aphids (e.g. Neuroptera; Diptera, Syrphidae, etc.).

Host information on some non-British species of *Dendrocerus*

The above pattern of host choice is typical of the genus as a whole. Host information about other *Dendrocerus* species is briefly listed below.

Host	*Dendrocerus* species	Country	Reference
DIPTERA			
Chamaemyiidae			
Leucopis atrifacies	*D. pinicolus*	U.S.A.	Muesebeck (1959:93)
L. sp.	*D. leucopidis*	U.S.A.	Muesebeck (1959:92)
Cecidomyiidae			
Mayetiola destructor	*D. triticum*	U.S.A.	Ashmead (1893:110)
Dipterous larvae	*D. koyamai*	Italy, Japan	Dessart (1972*a*:176)
NEUROPTERA			
Coniopterygidae			
Conwentzia hageni	*D. conwentziae*	U.S.A.	Gahan (1919:122)
Nimboa basipunctata	*D. indicus*	India	Dessart (1972*a*:171)
Hemerobiidae	*D. latifrons*	U.S.A.	Muesebeck (1959:94)
Chrysopidae			
Chrysopa madestes	*D. propodealis*	India	Dessart (1973:274)
C. sp.	*D. noumeae*	New Caledonia	Dessart (1967:346)
HEMIPTERA			
HOMOPTERA			
APHIDOIDEA			
Plocamaphis goernitzi	*D. remaudierei*	Europe	Dessart (1974*a*:82)
Macrosiphum euphorbiae	*D. attentus*	U.S.A.	Muesebeck (1959:96)
Macrosiphum euphorbiae	*D. incompletus*	U.S.A.	Muesebeck (1959:96)
Neuquenaphis similis	*D. henkvlugi*	Chile	Dessart (1975:266)
A wide range of aphids	*D. floridanus*	Japan, U.S.A.	Ashmead (1881:xxxiv)
COCCOIDEA			
Saissetia oleae	*D. noumeae*	New Caledonia	Dessart (1967:346)
COLEOPTERA			
Coccinellidae			
Pharoscymnus ovoideus	*D. ergensis*	Spain, North Africa	Ghesquière (1960:207)
P. numidicus	*D. ergensis*	North Africa	Ghesquière (1960:207)
Scymnus sp.	*D. ergensis*	North Africa	Ghesquière (1960:207)
Chilocorus kuwanae	*D. chilocori*	Japan	Ishii (1951:93)
HYMENOPTERA			
CHALCIDOIDEA			
Encyrtidae			
Homalotyus flaminius	*D. ergensis*	Spain, North Africa	Ghesquière (1960:207)
Homalotyus flaminius	*D. chilocori*	Japan	Ishii (1951:94)

Conostigmus has often been reported as a parasite of aphids, but it is probable that these records actually pertain to *Dendrocerus*. The record published by Jones (1972:13) refers to a specimen of *Dendrocerus* and not to *Conostigmus* (Jones, pers. comm.). According to Ashmead (1893:103) Riley reared a *Dendrocerus* sp. from a tortricid larva but Haviland (1920*b*:102) considered this to be unlikely.

In order that the biology of *Dendrocerus* can be easily related to that of the Aphidiidae, I have used the faunistic complexes adopted by Starý (1970:201–202, 312–321), as very briefly indicated below

Boreal Europe faunistic complex. Cooler climatic conditions, restricted to northern parts of Europe. Some typical species: *Decorosiphon* spp. / *Diaeretellus ephippium* / mosses; *Rhopalosiphum nymphaeae* / *Praon necans* / secondary host plants.

Eurasian steppe faunistic complex. Typical complex of steppe zone plus the cultivated steppe landscape. Some typical species: *Macrosiphoniella spp.* / *Aphidius absinthii* /–; *Acyrthosiphon* spp. / *Aphidius ervi* /–; *Cryptosiphum* spp. / *Ephedrus nacheri* /–; *Coloradoa* spp. / *Lysaphidus arvensis* /–; *Uroleucon* spp. / *Praon dorsale* /–; *Aphis* spp. / *Binodoxys acalephae* /–.

Deciduous forest (European) faunistic complex. Typical of the deciduous forests of Europe to which they are mostly restricted. Some typical species: *Liosomaphis berberidis* / *Aphidius hortensis* / *Berberis; Macrosiphum* spp. / *Aphidius rosae* /–; *Macrosiphum* spp. / *Aphidius lonicerae* /–; *Drepanosiphum* spp. / *Dyscritulus planiceps* / *Acer; Sitobion* spp. / *Monoctonus caricis* /–; *Periphyllus* spp. / *Trioxys falcatus* /–.

Deciduous forest (Far Eastern) faunistic complex. Typical of the deciduous forests of the Far East and penetrating to the allied tropics but some elements have a wide trans-palaearctic distribution. Some typical species: *Periphyllus* spp. / *Aphidius areolatus* / *Acer; Myzus* spp. / *Aphidius gifuensis* /–; *Tuberolachnus salignae* / *Salix.*

Coniferous forest (West Eurasian) faunistic complex. Members of this complex are distributed all over Europe in coniferous forests. Some typical species: *Cinara* spp. / *Metaphidius aterrimus* / conifers; Lachnidae aphids / *Pauesia* spp. / conifers.

Coniferous forest (East Eurasian) faunistic complex. Typical of the Far Eastern type of coniferous forest but some species are widely distributed in Europe. Typical species: Lachnidae aphids / *Pauesia* spp. / conifers; *Eulachnus* spp. / *Diaeretus leucopterus* / conifers.

Holarctic forest tundra faunistic complex. Typical of cool arctic conditions, it is a transitional zone between forest-free tundra to the north and mostly coniferous forests to the south. Typical trees: *Salix, Alnus, Betula* etc. Many elements of this complex are found further south. Typical species: *Pterocomma* spp. / *Aphidius cingulatus* / *Salix, Populus; Symydobius* / *Trioxys betulae.*

Non-British species

The following species occur in Europe but have not been found in the British Isles.

D. basalis (Thomson, 1858) was mentioned by Marshall (1868: 158; 1873: 3) as a synonym of *D. carpenteri* but it has not been directly recorded as a British species. The most similar British species to *D. basalis* is *D. pupparum*; in the discussion of the latter I have shown how the two species can be separated.

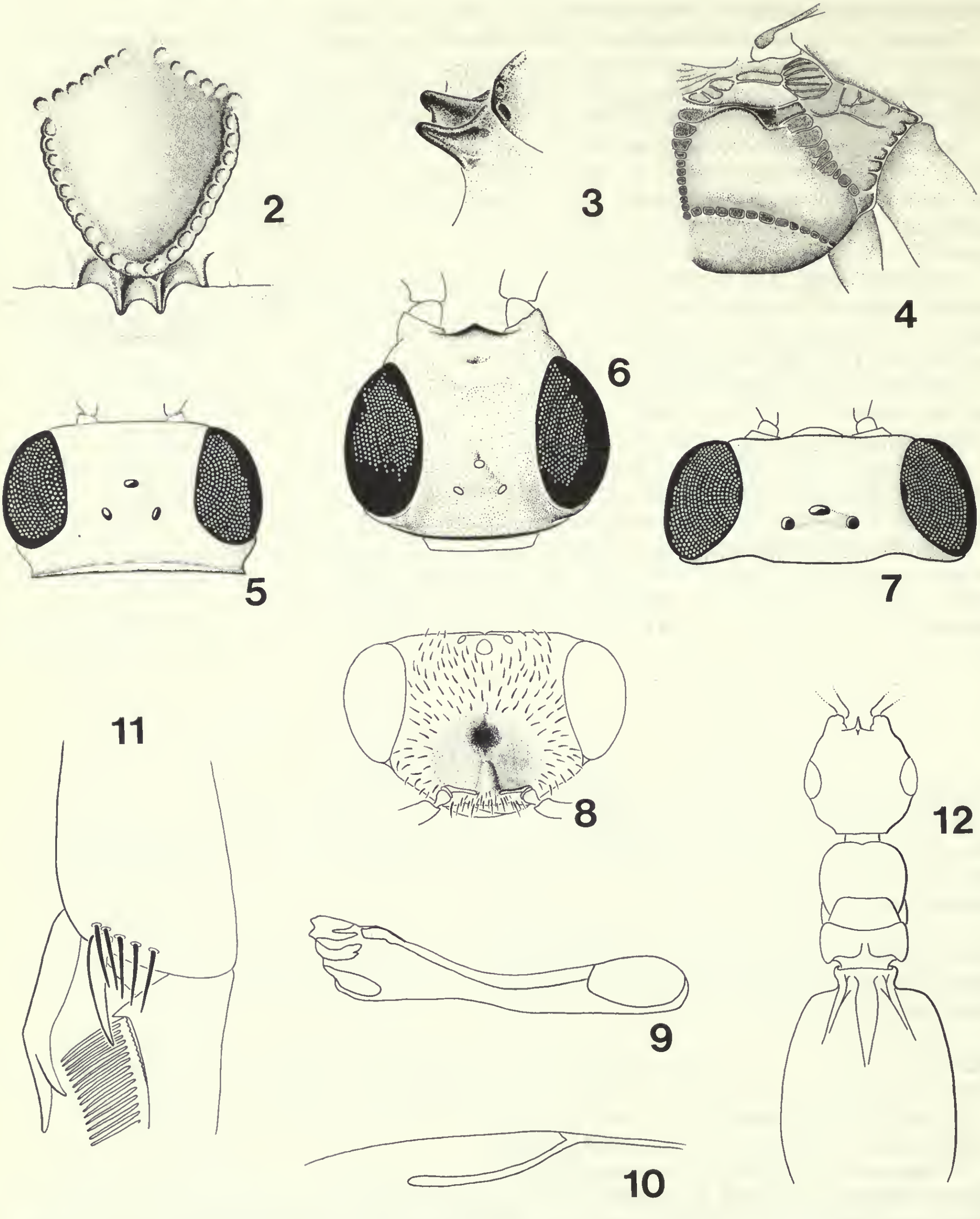
D. ergensis (Ghesquière, 1960) was described from North Africa, but I have seen specimens from Spain. This species is easily identified as the radius is shorter than the pterostigma and the notaulices are only present anteriorly; in males the basal flagellar segments are strongly serrate, about as long as broad.

D. koyamai (Ishii, 1951). This species was known only from Japan until Dessart (1974*a*: 75) recorded it from Italy. The radius is just shorter than the pterostigma, and in males the basal flagellar segments have projections similar to those found in *D. halidayi* and *D. ramicornis.*

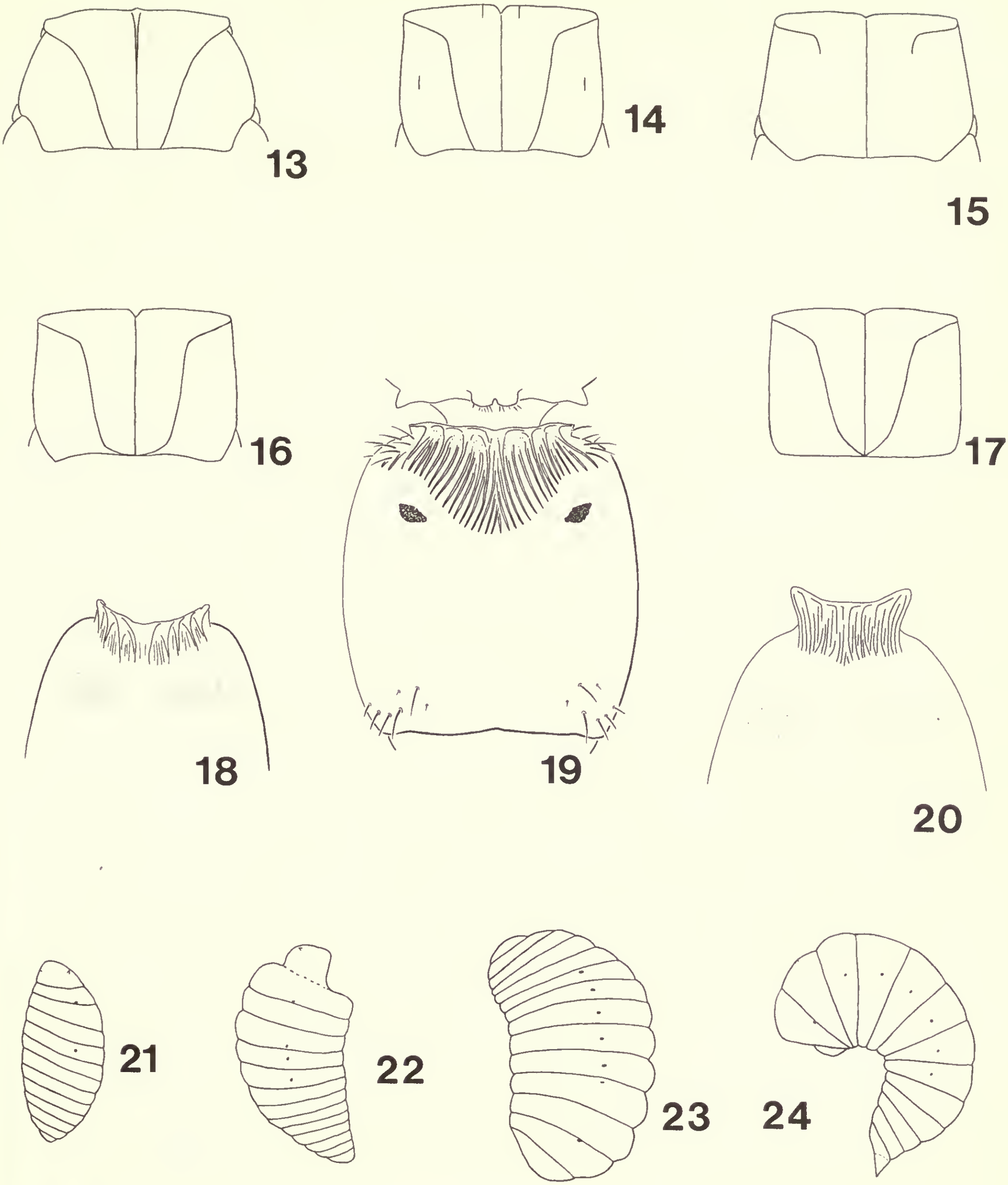
D. omostenus Dessart, 1979 is known only from the Algerian female holotype which I have examined and believe to be a *Conostigmus* species.

D. remaudierei Dessart, 1974 was described from France. It has characters in common with several different species of *Dendrocerus,* but it is distinguished by the following combination of characters. The notaulices are complete, the interantennal carina is absent, the wings are hyaline, the male antennae are only moderately serrate (L/B for AIII about 2·35), the flagellar pubescence in males is longer than the breadth of the segment and the parameres are enlarged and truncate.

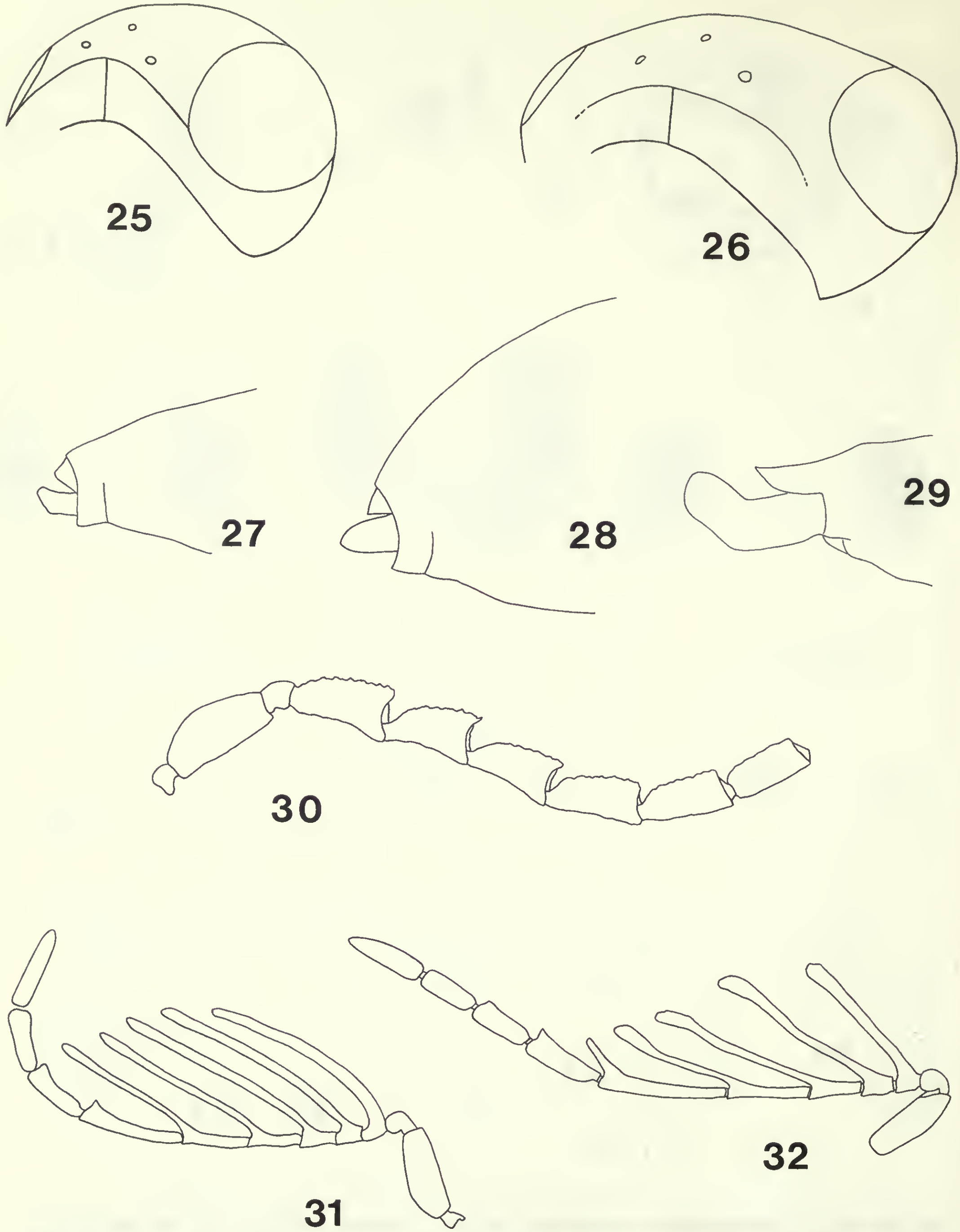
D. solarii (Kieffer, 1907) is known only from the Italian female holotype. It is distinguished from other European species by the following characters. The apex of the scutellum has foveolate sculpture which fades out laterally, the third antennal segment is elongate, about 3 times longer than broad, and the median fovea on the propodeum is prominent.



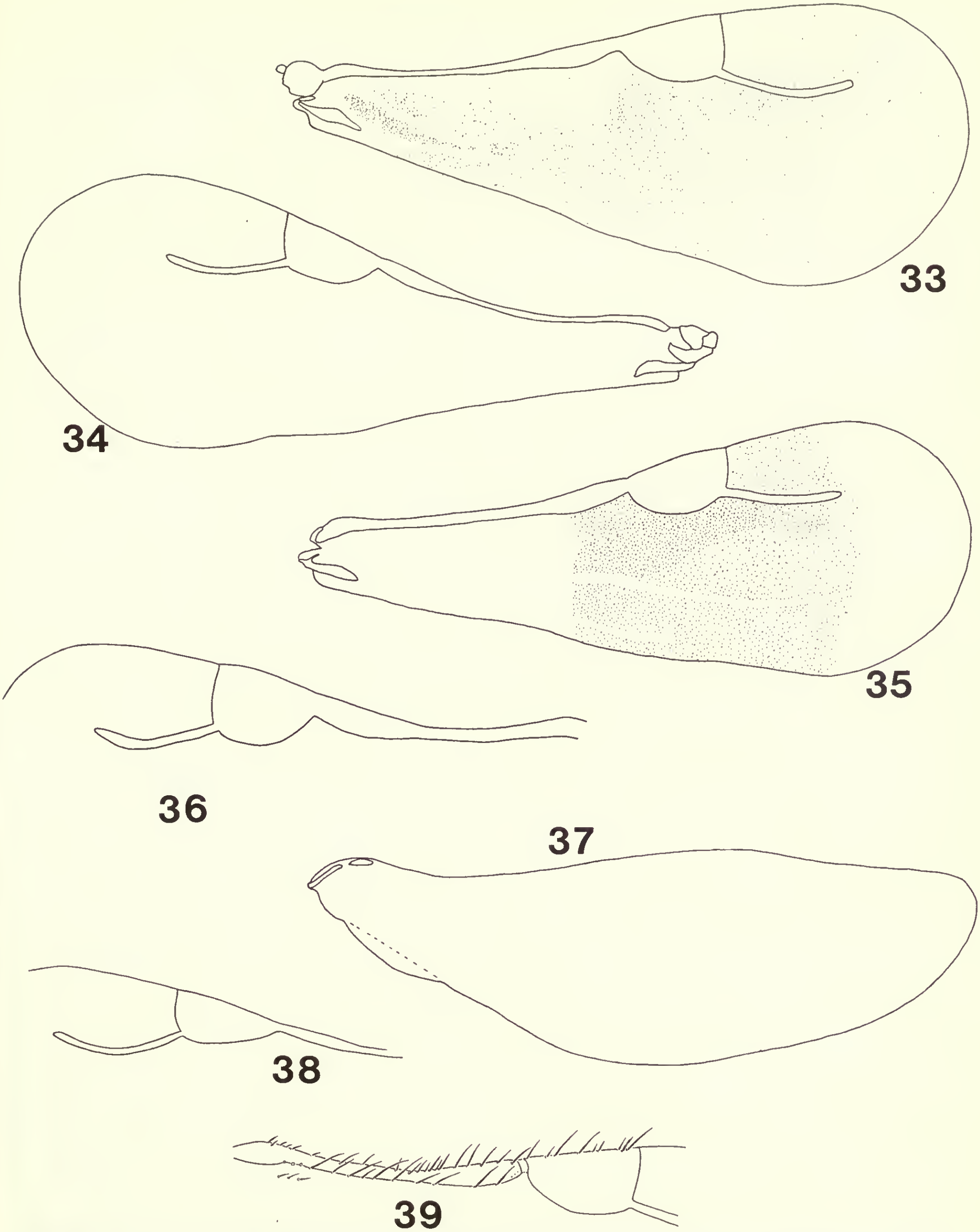
Figs 2–12 2–4, *Megaspilus* sp., (2) scutellum and propodeal projection; (3) dorso-lateral view of propodeal projection; (4) precoxal sulcus. 5, 6, heads of *Conostigmus* species. 7, 8, heads of (7) *Dendrocerus ramicornis*; (8) *D. pupparum*. 9, *Conostigmus* sp., brachypterous forewing. 10–12, *Lagynodes pallidus*, (10) forewing of male; (11) tibial spurs of foreleg; (12) female.



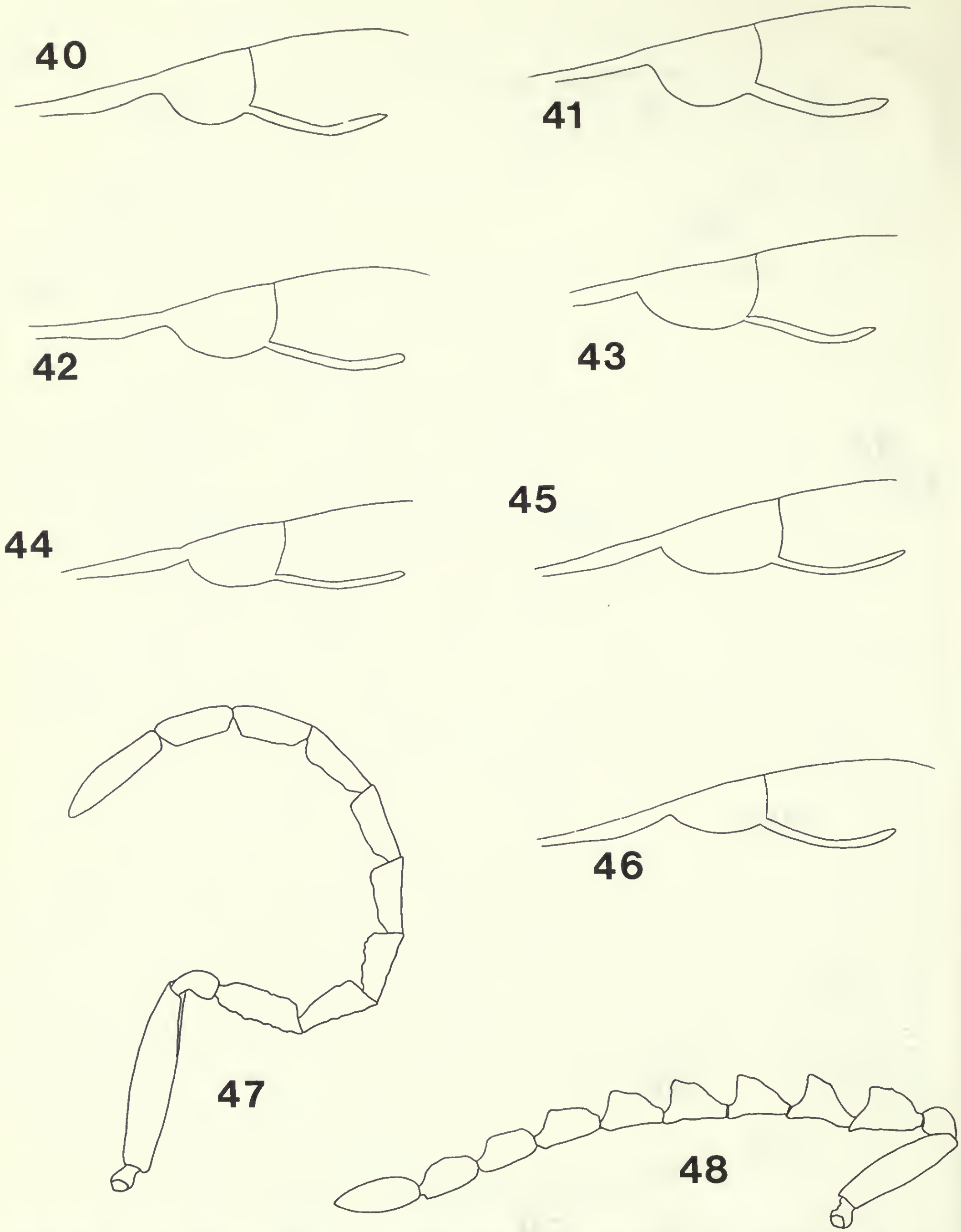
Figs 13–24 13, mesonotum of *Conostigmus* sp. 14–17, mesonota of (14) and (16) *Dendrocerus carpenteri*; (15) *D. laticeps*; (17) *D. liebscheri*. 18–20, gastral collar of (18) *Conostigmus fasciatipennis*; (19) *Dendrocerus spissicornis*; (20) *D. dubiosus*. 21–24, *D. carpenteri*, larval stages, (21) first instar; (22) second instar; (23) third instar; (24) fourth instar.



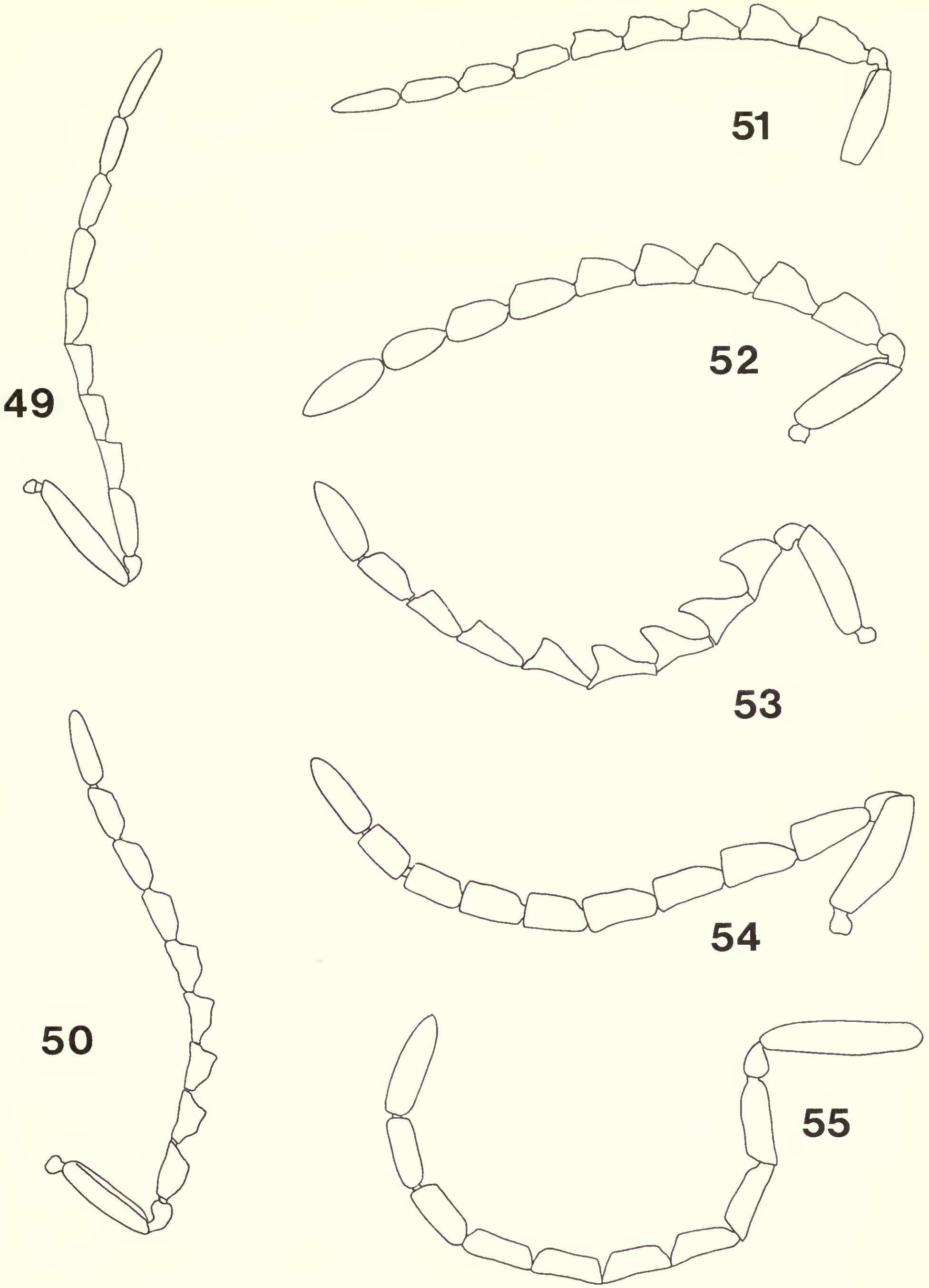
Figs 25–32 Males. 25, 26, head of (25) *Dendrocerus laevis*; (26) *D. laticeps*. 27–29, gaster showing parameres of (27) *D. liebscheri*; (28) *D. carpenteri*; (29) *D. pupparum*. 30–32, antennae of (30) *D. flavipes*; (31) *D. ramicornis*; (32) *D. halidayi*.



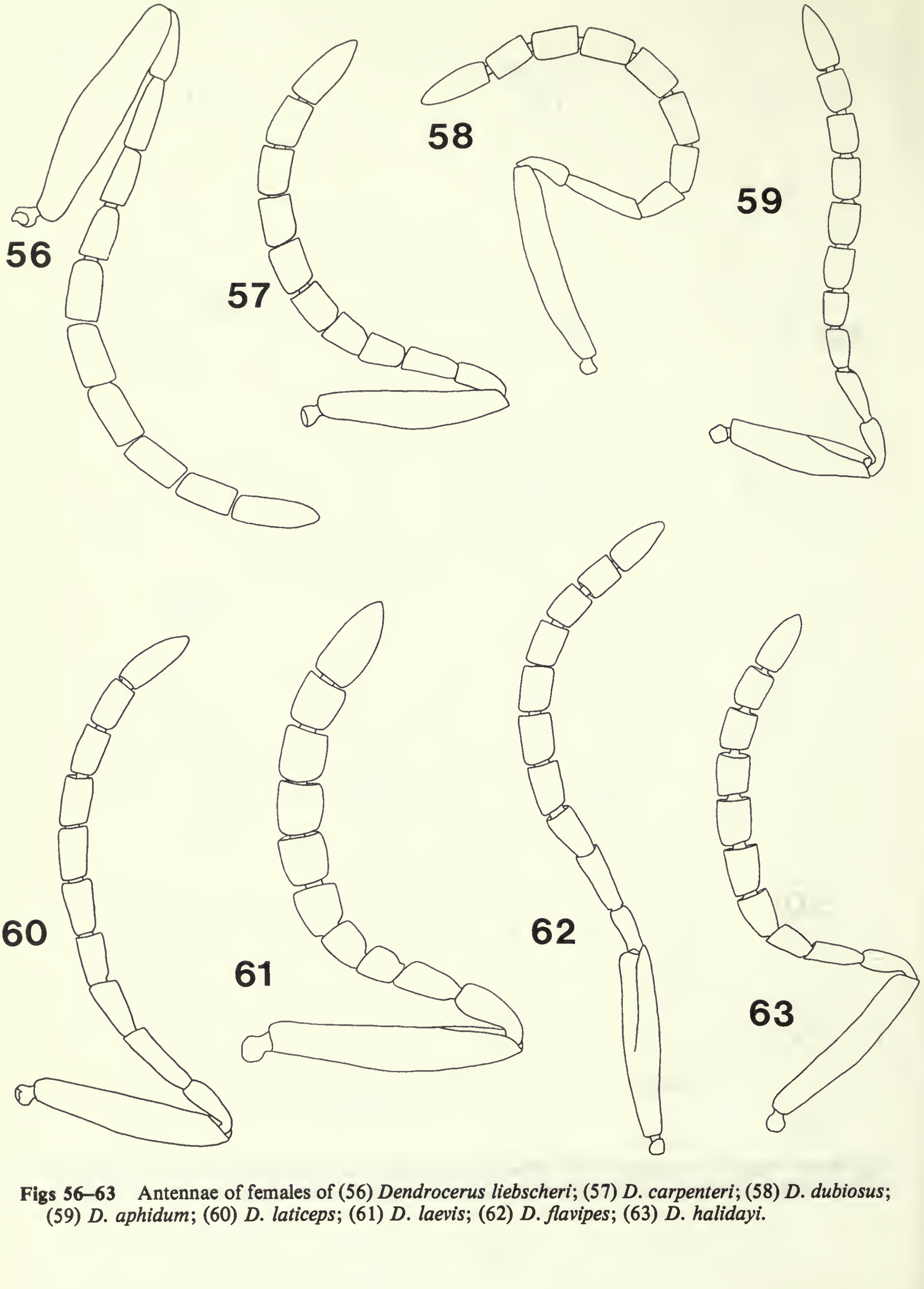
Figs 33–39 33–38, wings of (33) *Dendrocerus aphidum*; (34) *D. laticeps*; (35) *D. flavipes*; (36) *D. laevis*; (37) *D. ramicornis*; (38) *D. bifoveatus*. 39, coastal vein and pterostigma of *Conostigmus fasciatipennis*.



Figs 40–48 40–46, pterostigma and radius of (40) *Dendrocerus carpenteri*; (41) *D. ramicornis*; (42) *D. liebscheri*; (43) *D. serricornis*; (44) *D. pupparum*; (45) *D. halidayi*; (46) *D. dubiosus*. 47, 48, antennae of males of (47) *D. laticeps*; (48) *D. laevis*.



Figs 49–55 Antennae of males of (49) *Dendrocerus dubiosus*; (50) *D. aphidum*; (51) *D. carpenter*; (52) *D. liebscheri*; (53) *D. serricornis*; (54) *D. pupparum*; (55) *D. bifoveatus*.


56
57
58
59
60
61
62
63

Figs 56–63 Antennae of females of (56) *Dendrocerus liebscheri*; (57) *D. carpenteri*; (58) *D. dubiosus*; (59) *D. aphidum*; (60) *D. laticeps*; (61) *D. laevis*; (62) *D. flavipes*; (63) *D. halidayi*.

Doubtfully placed species

Kieffer described the following species from specimens in the L. Carpentier collection: *Lygocerus antennalis* Kieffer, 1907:46; *L. antennalis subserratus* Kieffer, 1907:62 and *L. subtruncatus* Kieffer, 1907:44. The type-material cannot be found amongst the Carpentier material in the MP, Amiens and the identity of these species cannot be ascertained from the descriptions alone.

The type of *Ceraphron rosularum* Ratzeburg is lost. Dessart (1972*a*:262) and Bouček (1964:664) have been unable to recognize the type from the mixed series of three specimens (one *D. serricornis* and two *D. carpenteri*) remaining under this name in the Ratzeburg collection.

Tshumakova (1956:114) described *Lygocerus dauricus* from the U.S.S.R. The type of this species has not been located.

Acknowledgements

I am pleased to register my thanks to Mr T. Huddleston for his advice and criticism, to Dr V. F. Eastop for identifying aphid mummies, and to Mr A. Sutton for drawing figures 1–8, 11, 12, 18–20 and 39. I would also like to thank Dr H. Takada and Dr H. H. Evenhuis for their gifts of bred material.

I am grateful to the following persons for providing loans of specimens: Dr V. N. Alekseev (ZMMLSU, Moscow); Dr C. Besuchet (MHN, Geneva); Mr A. Brindle (MM, Manchester); Dr V. Chambers; Dr T. H. Chua (UM, Kuala Lumpur); Mr R. Danielsson (ZI, Lund); Dr P. Dessart (IRSNB, Brussels); Dr F. N. Dingemans-Bakels (NHM, Maastricht); Dr H. H. Evenhuis (IPO, Wageningen); Dr B. Gustafsson (NR, Stockholm); Dr K. J. Hedqvist (NR, Stockholm); Dr W. Hellén (ZMU, Helsinki); Dr M. G. Jones (RES, Harpenden); Dr P. I. Persson (NR, Stockholm); Mme S. Kelner Pillault (MNHN, Paris); Dr E. Königsmann (MNHU, Berlin); Mrs S. Mascherini (MZU, Florence); Dr P. M. Marsh (USNM, Washington); Prof. H. Morge (IP, Eberswalde); Dr A. Neboiss (NM, Victoria); Dr J. P. O'Connor (NMI, Dublin); Dr G. Osella (MCSN, Verona); Mr C. O'Toole (UM, Oxford); Dr R. Poggi (MCSN, Genoa); Dr G. Remaudiere (IP, Paris); Prof. G. C. Varley (UM, Oxford) and Dr I. D. Wallace (MCM, Liverpool).

References

Ashmead, W. H. 1881. Studies on the North American Chalcididae with descriptions of new species from Florida. *Trans. Am. ent. Soc.* **9:** xxix–xxxv.

——1887. Studies on the North American Proctotrupidae with descriptions of new species from Florida. *Entomologica am.* **3:** 73–76, 97–100, 117–119.

—— 1893. Monograph of the North American Proctotrypidae. *Bull. U.S. natn. Mus.* **45:** 472 pp.

—— 1904. Descriptions of new Hymenoptera from Japan – 1. *Jl. N.Y. ent. Soc.* **12:** 65–84.

Bankowska, R. 1975. Aphid-aphidophage community in alfalfa cultures (*Medicago sativa* L) in Poland. Pt. 1 Structure and phenology of the community. *Annls zool. Warsz.* **32:** 299–345.

Bin, F. 1977. Preliminary report on a new structure in *Trissolcus* Ashm. (Hymenoptera, Scelionidae). *Redia* **60:** 453–456.

Blanchard, M. E. 1840. *Histoire naturelle des insectes* **3:** 672 pp. Paris.

Boheman, C. H. 1832. Försök till beskrifning af de i Sverige funne Arter, hörande till Insekt-slägtet *Ceraphron. K. svenska VetenskAkad. Handl.* **1831:** 322–339.

Boness, M. 1958. Biocoenotische Untersuchungen über die Tierwelt von Klee- und Luzernefeldern. *Z. Morph. Ökol. Tiere* **47:** 309–373.

Bouček, Z. 1964. Proctotrupoidea und Chalcidoidea aus den Resten der Ratzeburg-Sammlung. *Beitr. Ent.* **14:** 663–673.

Buckton, G. B. 1876. *Monograph of the British aphides* **1:** 193 pp., 38 pls. London.

Cameron, P. 1907. On the Scottish species of *Oxyura* (Proctotrypidae) – Part 2. *Ann. Scot. nat. Hist.* **63:** 158–161.

Campbell, A. & Mackauer, M. 1975. Thermal constants for development of the pea aphid (Homoptera: Aphididae) and some of its parasites. *Can. Ent.* **107:** 419–423.

Chua, T. H. 1977. Population studies of *Brevicoryne brassicae* its parasites and hyperparasites in England. *Res. pop. Ecol.* **19:** 125–139.

Couchman, J. R. 1977. A collection of aphid parasites and hyperparasites (Hym.) from Iceland. *Norw. J. Ent.* **24:** 121–124.

Cumber, R. A. & Eyles, A. C. 1961. Insects associated with the major fodder crops in the North Island. IV Hymenoptera. *N.Z. Jl agric. Res.* **4:** 390–408.

Curtis, J. 1829*a*. *British entomology*. **6:** folios 242–289. London.

—— 1829*b*. *A guide to an arrangement of British insects* 256 pp. London.

—— 1860. *Farm insects*. 528 pp. London.

Dalla Torre, C. G. 1898. *Catalogus Hymenopterorum* **5:** Chalcididae et Proctotrupidae. 598 pp.

Dean, G. J. 1974. Effects of parasites and predators on the cereal aphids *Metopolophium dirhodum* and *Macrosiphum avenae* (Hem., Aphididae). *Bull. ent. Res.* **63:** 411–422.

Delucchi, V. & Pschorn-Walcher, H. 1954. *Cremifania nigrocellulata* Czerny (Diptera, ?Chamaemyiidae), ein Räuber an *Dreyfusia (Adelges) piceae* Ratz. (Hemiptera, Adelgidae). *Z. angew. Ent.* **36:** 84–107.

Dessart, P. 1965*a*. Contribution à l'étude des Hyménoptères Proctotrupoidea (IX). Revision du genre *Macrostigma* Rondani 1877 (Ceraphronidae, Megaspilinae). *Redia* **49:** 157–163.

—— 1965*b*. Contribution à l'étude des Hyménoptères Proctotrupoidea (VI). Les Ceraphroninae et Quelques Megaspilinae (Ceraphronidae) du Musée Civique d'Histoire Naturelle de Genes. *Bull. Annls Soc. r. ent. Belg.* **101:** 105–192.

—— 1966. Contribution à l'étude des Hyménoptères Proctotrupoidea (XII). A propos des Ceraphronidae Megaspilinae mâles à antennes rameuses. *Bull. Inst. r. Sci. nat. Belg.* **42** (32): 1–16.

—— 1967. Description de *Dendrocerus* (*Macrostigma*) *noumeae* sp. nov. de Nouvelle Calédonie. *Entomophaga* **12:** 343–349.

—— 1970. A propos de l'identité de *Ceraphron carpenteri* Curtis, 1829 (Hym. Ceraphronoidea, Megaspilidae). *Bull. Annls Soc. r. ent. Belg.* **106:** 142–144.

—— 1972*a*. Révision des espèces européennes du genre *Dendrocerus* Ratzeburg, 1852 *(Hymenoptera, Ceraphronoidea). Mém. Soc. r. ent. Belg.* **32:** 310 pp.

—— 1972*b*. Un synonyme Américain et Australien de *Dendrocerus carpenteri* (Curtis, 1829). *Bull. Annls Soc. r. ent. Belg.* **108:** 239–241.

—— 1972*c*. A propos de quelques types d'anciennes espèces de Megaspilidae. *Bull. Annls Soc. r. ent. Belg.* **108:** 234–238.

—— 1973. *Dendrocerus propodealis* sp. n. (Hym. Ceraphronoidea) parasite de *Chrysopa madestes* Banks (Neur. Chrysopidae) en Inde. *Bull. Annls Soc. r. ent. Belg.* **109:** 269–276.

—— 1974*a*. Compléments à l'etude des *Dendrocerus* Européens (Hym. Ceraphronoidea Megaspilidae). *Bull. Annls Soc. r. ent. Belg.* **110:** 69–84.

—— 1974*b*. Les Mégaspilides Européens (Hym. Ceraphronoidea) parasites des Diptères Syrphides avec une révision du genre *Trichosteresis. Annls Soc. ent. Fr.* (N.S.) **10:** 395–448.

—— 1975. Quelques *Dendrocerus* (Hym. Ceraphronoidea Megaspilidae) du Chili. *Bull. Annls Soc. r. ent. Belge* **111:** 262–269.

—— 1978. On two species of *Dendrocerus* (*Atritomellus*) (Hym. Ceraphronoidea Megaspilidae), parasites of *Coniopterix esbenpeterseni* (Neuroptera) in Italy. *Bull. Annls Soc. r. ent. Belg.* **114:** 117–182.

—— 1979. Quelques Megaspilidae d'Algérie (Hym. Ceraphronoidea). *Bull. Annls Soc. r. ent. Belg.* **115:** 33–38.

Dill, W. 1937. Der Entwicklungsgang der mehligen Pflaumenblattlaus *Hyalopterus arundinis* Fabr. im schweizerischen Mittelland. *Mitt. aargau. naturf. Ges.* **20:** 157–240.

Donisthorpe, H. St. J. K. 1927. *The guests of British ants. Their habits and life-histories* xxiii + 244 pp. London.

Dours, A. 1873. Catalogue synonymique des Hyménoptères de France. *Mém Soc. linn. N. Fr.* **3:** 1–230.

Dunn, J. A. 1949. The parasites and predators of potato aphids. *Bull. ent. Res.* **40:** 97–122.

Eady, R. D. 1968. Some illustrations of microsculpture in the Hymenoptera. *Proc. R. ent. Soc. Lond.* **43:** 66–72.

Eastop, V. F. & Hille Ris Lambers, D. 1976. *Survey of the world's aphids* 573 pp. The Hague.

Evenhuis, H. H. 1964. The interrelations between apple aphids and their parasites and hyperparasites. *Entomophaga* **9:** 227–231.

—— 1966. Host specificity in the parasites and hyperparasites of apple aphids. *In* Hodek, I., *Ecology of aphidophagous insects* 360 pp. The Hague.

—— 1968. The natural control of the apple-grass aphid, *Rhopalosiphum insertum,* with remarks on the control of apple aphids in the Netherlands in general. *Neth. J. Pl. Path.* **74:** 106–117.

Ferrière, C. & Voukassovitch, P. 1928. Sur les parasites des aphides et leurs hyperparasites. *Bull. Soc. ent. Fr.* **2:** 26–29.

Foerster, A. 1856. *Hymenopterologische Studien* 2 Chalcidiae und Proctotrupii 152 pp.

—— 1878. Kleine Monographien parasitischer Hymenopteren. *Verh. naturh. Ver. preuss. Rheinl.* **35:** 42–82.

Fulmek, C. 1968. Parasitinsekten der Insektengallen Europas. *Beitr. Ent.* **18:** 719–952.

Gahan, A. B. 1919. A new species of the serphoid genus *Dendrocerus* (Hymenoptera). *Proc. ent. Soc. Wash.* **21:** 121–123.

Garbarczyk, H. 1977. Sex structure of the populations of species forming a complex of parasitoids of the pea aphid, *Acyrthosiphon pisum. Annls zool. Warsz.* **33:** 445–454.

Gatenby, J. G. 1919. Notes on the bionomics, embryology, and anatomy of certain Hymenoptera Parasitica especially of *Microgaster connexus* (Nees). *J. Linn. Soc.* (Zool.) **33:** 387–416, 3 pls.

Ghesquière, J. 1960. Le genre *Atritomellus* Kieffer en Afrique du Nord. *Bull. Annls Soc. r. ent. Belg.* **96:** 205–215.

Giraud, J. E. & Laboulbène, A. 1877. Liste des éclosions d' insectes. *Annls Soc. ent. Fr.* **7:** 397–436.

Gourlay, E. S. 1930. Some parasitic Hymenoptera of economic importance in New Zealand. *N.Z. Jl Sci. Technol.* **11:** 339–343.

Hafez, M. 1961. Seasonal fluctuations of population density of the cabbage aphid, *Brevicoryne brassicae* (L.), in the Netherlands, and the role of its parasite, *Aphidius* (*Diaeretiella*) *rapae* (Curtis). *Tijdschr. Plantenziekten* **67:** 445–548.

Haviland, M. D. 1920*a*. Preliminary note on the life history of *Lygocerus* (Proctotrypidae), hyperparasite of *Aphidius. Proc. Camb. phil. Soc.* **19:** 293–295.

—— 1920*b*. On the bionomics and development of *Lygocerus testaceimanus* Kieffer, and *Lygocerus cameroni* Kieffer (Proctotrypoidea – Ceraphronidae), parasites of *Aphidius* (Braconidae). *Q. Jl microsc. Sci.* **65:** 101–127.

Hedicke, H. 1929. *Atritomellus laticeps* n. sp. (Hym. Callicerat.), ein neuer Parasit eines eingeschleppten Rüsselkäfers. *Z. wiss. InsektBiol.* **24:** 59–61.

Hellén, W. 1966. Die Ceraphroniden Finnlands (Hymenoptera: Proctotrupoidea). *Fauna fenn.* **20:** 1–45.

Henriksen, K. L. 1918. De europaeiske vandsnyltehvepse og deres Biologi. *Ent. Meddr* **12:** 137–251.

Howard, L. O. 1890. Some new parasites of the grain plant louse. *Insect Life, Wash.* **2:** 246–248.

International Commission on Zoological Nomenclature. 1964. *International code of zoological nomenclature* xix + 176 pp. London.

Ishii, T. 1951. Eine neue Gattung und zwei neue Arten von Calliceratidae (Ceraphronidae). *Oyo-Dobuts. Zasshi* **16:** 93–95.

Ivanova-Kazas, O. M. 1955. Secondary parasites of certain aphids of Turkmenistan (Hymenoptera: Chalcidoidea, Serphoidea, Cynipoidea). *Ént. Obozr.* **34:** 144–156.

Jones, M. G. 1972. Cereal aphids, their parasites and predators caught in cages over oat and winter wheat crops. *Ann. appl. Biol.* **72:** 13–25.

Kaissling, K. E. 1971. Insect olfaction. *Handbk sensory Physiol.* **4:** 351–431.

Kieffer, J. J. 1905. Beschreibung neuer Proctotrypiden aus Nord- und Zentralamerika. *Berl. ent. Z.* **50:** 237–290.

—— 1907. Ceraphroninae. *In* André, E., *Species des Hyménoptères d'Europe et d'Algérie* **10:** 1–288.

—— 1914. Hymenoptera Proctotrupoidea. Serphidae (= Proctotrupidae) et Calliceratidae (= Ceraphronidae). *Tierreich* **42:** xvii + 254 pp.

—— 1917. Über neue und bekannte Microhymenopteren. *Ent. Meddr* **11:** 341–350.

Kirchner, L. 1867. *Catalogus hymenopterorum Europae* 285 pp. Vienna.

Kloet, G. S. & Hincks, W. D. 1945. *A check list of British insects* lix + 483 pp. Stockport.

—— —— 1964. A check list of British insects. Second edition (revised), part I: small orders and Hemiptera. *Handbk Ident. Br. Insects* **11** (1): xv + 119 pp.

—— —— 1978. A check list of British insects. Second edition (completely revised), part 4: Hymenoptera. *Handbk Ident. Br. Insects* **11** (4): ix + 159 pp.

Kryger, I. P. & Schmiedeknecht, O. 1938. XLIII Hymenoptera *Zoology Faroes.* **2** (2): 1–108.

Lal, K. B. 1934. Insect parasites of Psyllidae. *Parasitology, Cambridge* **26:** 325–334.

Lowe, A. D. 1968. The incidence of parasitism and disease in some populations of the cabbage aphid (*Brevicoryne brassicae* L.) in New Zealand. *N.Z. Jl agric. Res.* **11:** 821–848.

Mackauer, M. 1968. *Hymenopterorum Catalogus (nova editio)* Pars 3 Aphidiidae. 103 pp. The Hague.

Malaquin, A. & Moitié, A. 1914. Les Hyménoptères parasites de *l'Aphis euonymi* (Puceron noir de la Betterave). *C. r. Séanc. Soc. Biol.* **76:** 803–805.

Maneval, H. 1940. *In* Berland, L., Hyménoptères. *Faune Fr.* **7:** 94–118.

Mani, M. S. 1939. Descriptions of new and records of some known chalcidoid and other hymenopterous parasites from India. *Indian J. Ent.* **1:** 69–99.

—— 1941. Studies on Indian parasitic Hymenoptera – 1. *Indian J. Ent.* **3:** 25–36.

Marshall, T. A. 1868. Notes on some parasitic Hymenoptera, with descriptions of new species. *Entomologist's mon. Mag.* **5:** 154–160.

—— 1872. Description of a new species of *Aphidius* from Britain. *Entomologist's mon. Mag.* **9:** 123–124.

—— 1873. *A catalogue of British Hymenoptera; Oxyura* viii + 27 pp. London.

—— 1891–96. Les Braconides. *In* André, E., *Species des Hyménoptères d'Europe et d'Algérie* **5:** 635 pp., 20 pls. Paris.

Masner, L. 1965. The types of Proctotrupoidea (Hymenoptera) in the British Museum (Natural History) and in the Hope Department of Entomology, Oxford. *Bull. Br. Mus. nat. Hist.* (Ent.) Suppl. 1: 154 pp.

Masner, L. & Muesebeck, C. F. W. 1968. The types of Proctotrupoidea (Hymenoptera) in the United States National Museum. *Bull. U.S. natn. Mus.* no. 270: 143 pp.

Meyer, N. F. 1929. Schlupfwespen die in Russland in den Jahren 1881–1926 aus Schädlingen gezogen sind (Vortsetzung). [In Russian.] *Izv. Otd. prikl. Ent.* **4:** 231–248.

Morley, C. 1929. Catalogus Oxyurarum Britannicorum. *Trans. Suffolk Nat. Soc.* **1:** 39–60.

Muesebeck, C. F. W. 1959. New reared species of *Lygocerus* Foerster (Hymenoptera: Ceraphronidae). *Ent. News* **70:** 91–96.

Muesebeck, C. F. W., Krombein, K. V. & Townes, H. K. 1951. Hymenoptera of America north of Mexico. Synoptic catalog. *U.S. Dept. Agric. Monogr.* **2:** 1420 pp.

Muesebeck, C. F. W. & Walkley, L. M. 1956. Type species of the genera and subgenera of parasitic wasps comprising the superfamily Proctotrupoidea (Order Hymenoptera). *Proc. U.S. natn. Mus.* **105:** 319–419.

Nees ab Esenbeck, C. G. 1834. *Hymenopterorum Ichneumonibus affinium monographiae, genera Europaea et species illustrantes* **2:** 448 pp. Stuttgart & Tubingen.

Paetzold, D. & Vater, G. 1967. Populationsdynamische Untersuchungen an den Parasiten und Hyperparasiten von *Brevicoryne brassicae* (L.) (Homoptera, Aphididae). *Acta ent. bohemoslovaca* **64:** 83–90.

Pass, B. C. & Parr, J. C. 1971. Seasonal occurrence of the pea aphid and a braconid parasite *Aphidius smithi* in Kentucky. *J. econ. Ent.* **64:** 1150–1153.

Petherbridge, F. R. & Mellor, J. E. 1936. Observations on the life history and control of the cabbage aphis *Brevicoryne brassicae*. *Ann. appl. Biol.* **23:** 329–341.

Pruthi, H. S. & Mani, M. S. 1942. Distribution, hosts and habits of the Indian Serphoidea and Bethyloidea. *Mem. Indian Mus.* **13:** 405–444.

Ratzeburg, J. T. C. 1844. *Die Ichneumonen der Forstinsecten in forstlicher und entomologischer Beziehung, Ein Anhang zur Abbildung und Beschreibung der Forstinsecten* **1:** 244 pp, 4 pls. Berlin.

—— 1848. *Ibid* — **2:** 238 pp. Berlin.

—— 1852. *Ibid* — **3:** 272. Berlin.

Regnier, R. 1923. De quelques grands ennemis du pommier et de leurs parasites. *Revue Bot. appl. Agric. col.* **3:** 169–185.

Reitter, E. 1877. Beiträge zur Käferfauna von Japan. *Dt. ent. Z.* **21:** 369–384.

Richards, O. W. 1977. Hymenoptera: introduction and key to families. Second (revised) edition. *Handbk Ident. Br. Insects* **6** (1): 100 pp.

Risbec, J. 1858. Contributions à la connaissance des Hyménoptères Chalcidoides et Proctototrupoides de l'Afrique Noire. *Annls Mus. r. Congo Belge* **64:** 7–139.

Rondani, C. 1874. Nuove osservazioni sugli insetti fitofagi e sui loro parassiti. *Boll. Soc. ent. ital.* **6:** 130–136.

—— 1877. Vesparia parasita non vel minus cognita. *Boll. Soc. ent. ital.* **9:** 166–213.

Rothschild, G. H. L. 1963. Records of hymenopterous parasites and hyperparasites of certain fruit-tree aphids. *Entomologist's mon. Mag.* **99:** 126–127.

Schremmer, F. 1956. Über ein Vorkommen der Tannenstammlaus *Dreyfusia* (*Adelges*) *piceae* Ratz. im Wienerwald und ihren Vertilgerkreis. *Pflanzenschutzberichte* **16:** 49–69.

Skripchinskii, G. 1930. Zur Biologie von *Aphidius granarius* Marsh. und *Ephedrus plagiator* Nees (Braconidae) parasiten von *Aphis padi* L. *Rev. appl. Ent.* (A) **19:** 281.

Snodgrass, R. E. 1935. *Principles of insect morphology* ix + 667 pp. New York & London.

Spencer, H. 1926. Biology of the parasites and hyperparasites of aphids. *Ann. ent. Soc. Am.* **19:** 119–157.

Starý, P. 1970. *Biology of aphid parasites (Hymenoptera: Aphidiidae) with respect to integrated control* 643 pp. The Hague.

—— 1973. A review of the *Aphidius* species (Hymenoptera, Aphidiidae) of Europe. *Annotnes Zool. Bot. Bratislava* **84:** 1–85.

—— 1977. *Dendrocerus* hyperparasites of aphids in Czechoslovakia (Hymenoptera, Ceraphronoidea). *Acta ent. bohemoslovaca* **74:** 1–9, 1 pl.

Stephens, J. F. 1829. *A systematic catalogue of British insects* xxxiv + 416 + 388 pp. London.

Sullivan, D. J. & Van Den Bosch, R. 1971. Field ecology of the primary parasites and hyperparasites of the potato aphid *Macrosiphum euphorbiae* in the east San Francisco bay area. *Ann. ent. Soc. Am.* **64:** 389–394.

Takada, H. 1973. Studies on aphid hyperparasites of Japan. I, aphid hyperparasites of the genus *Dendrocerus* Ratzeburg occurring in Japan (Hymenoptera: Ceraphronidae). *Insecta matsum.* (N.S.) **2:** 1–37.

—— 1976. Studies of aphids and their parasites on cruciferous crops and potatoes. *Kontyû* **44:** 234–253, 366–384.

Thomson, C. G. 1858. Sveriges Proctotruper. *K. Svenska VetenskAkad. Förh. Stockh.* **15:** 287–358.

Thuneberg, E. 1959. Ein kleiner Beitrag zur Kenntnis der Schlupfwespen Finnlands. *Natul. ent.* **39:** 23–24.

Tillyard, R. J. 1926. *The insects of Australia and New Zealand* 560 pp. Sydney.

Todd, D. H. 1957. Incidence and parasitism of insect pests of cruciferous crops in Hawke's Bay Wairarapa and Manawatu, 1955–56. *N.Z. Jl Sci. Technol.* (A) **38**(7): 720–727.

Treherne, R. C. 1916. A preliminary list of parasitic insects known to occur in Canada. *Rep. ent. Soc. Ont.* **36** (1915): 178–193.

Tshumakova, B. M. 1956. On some Hymenoptera Chalcidoidea and Serphoidea parasites of Coccoidea in Ussuri land. [In Russian.] *Ént. Obozr.* **35:** 109–119.

Valentine, E. W. 1975. Additions and corrections to Hymenoptera hyperparasitic on aphids in New Zealand. *NZ. Ent.* **6:** 59–61.

Viggiani, G. 1967. Ricerche sugli Hymenoptera Chalcidoidea XIII sugli entomoparassiti della *Semidalis aleurodiformis* Steph. (Neur. Coniopterygidae), con descrizione di un nuovo genere di Encyrtidae (Prima nota). *Boll. Lab. Ent. agr. Filippo Silvestri* **25:** 163–175.

—— 1970. Lo *Pseudococcus fragilis* Brain (Homoptera Pseudococcidae) sugli Agrumi in Campania (notizie preliminari). *Boll. Lab. Ent. agr. Filippo Silvestri* **28:** 55–59.

Voukassovitch P. 1925. Observations biologiques sur quelques parasites des pucerons du rosier et leurs hyperparasites. *C. r. Séanc. Soc. Biol.* **93:** 655–656.

—— 1928. Contribution à l'étude des insectes parasites entomophages. *Glasn. srpsk. Akad. Nauka* **62:** 49–72.

Walden, B. H. 1926. Outbreak of pea aphid on alfalfa. *Bull. Conn. agric. Exp. Stn.* no. 275: 295–298.

Ward, K. M. 1934. The green peach aphid (*Myzus persicae* Sulzer) in relation to the peach in Victoria, and the measures investigated for its control. *J. Dep. Agric. Vict.* **32:** 144–145.

Westwood, J. O. 1840. *An introduction to the modern classification of insects* **2:** xi + 587 + 158 pp. London.

Wilson, F. 1938. Notes on the insect enemies of *Chermes* with particular reference to *Pineus pini*, Koch, and *P. strobi*, Hartig. *Bull. ent. Res.* **29:** 373–389.

Wimshurst, F. M. 1925. The cherry black fly (*Myzus cerasi*). *Bull. ent. Res.* **16:** 85–94.

Withycombe, C. L. 1923. Notes on the biology of some British Neuroptera (Planipennia). *Trans. ent. Soc. Lond.* **1922:** 501–594.

—— 1924. Note on the economic value of the Neuroptera, with special reference to the Coniopterygidae. *Ann. appl. Biol.* **11:** 112–125.

Wollaston, T. V. 1858. Brief diagnostic characters of undescribed Madeiran insects. *Ann. Mag. nat. Hist.* (3) **1:** 18–28.

Yasumatsu, K. 1947. Two hymenopterous parasites of the grain Aphis *Macrosiphum granarium* (Kirby) in Hikosan Kyushu. *Mushi* **17** (17): 113–114.

——**, Ishihara, T. & Moritsu, M.** 1946. Five hymenopterous parasites of *Tuberolachnus saligna* Gmelin (Aphididae) from Japan. *Mushi* **17** (3): 9–12.

Zetterstedt, J. W. 1838. *Insecta Lapponica* vi + 1139 pp. Leipzig.

Index

Page numbers of principal references are in **bold**. Synonyms and unavailable names are in *italics*.

africanus 259
alpestris 262, **276**
ambianus 262, **271**
ancyloneurus 262, **287**
antennalis 309
aphidivorus 262, **270**
aphidorum 261, **266**
aphidum 259, 261, 262, 263, 264, 265, **266**, 270, 271, 276, 277, 293, 294, 295, 296, 297, 299, 305, 307, 308
applanatus 262, 281, **282**
attentus 300

basalis 288
bicolor 261, 266, **267,** 276, 277
bifoveatus 260, 261, 264, **269,** 294, 296, 299, 305, 307
breadalbimensis 266, **267**
britannicus 262, **271**

callicerus 262, **279**
cameroni 262, **270,** 272
campestris 262, **270**
carpenteri 260, 261, 264, 266, **270,** 293, 294, 295, 296, 297, 298, 299, 303, 304, 306, 307, 308
chilocori 300
claripennis 262, **276**
coccophagus 259, 262, **281**
conwentziae 300
crispus 261, 270, **271**

damicornis 262, **279**
dauricus 309
dubiosus 262, 263, 264, **276,** 293, 294, 295, 296, 297, 298, 299, 306, 307, 308
dubitatus 259

elegans 261, **270,** 271
ergensis 300, **301**

flavipes 262, 263, 264, 276, **278,** 281, 297, 299, 304, 305, 308
flavus 262, **276**
floridanus 300
frenalis 261, **266,** 267
frontalis 262, **281,** 282
fuscipennis 261, **266**
fuscipes 262, 270, 271, **278,** 279
fusciventris 261, **266,** 267

giraudi 262, **270**
glabriculus 262, **288**

halidayi 256, 259, 261, 262, 263, 264, **279,** 297, 298, 299, 304, 306, 308
henkvlugi 300
hyalinatus 261, **270**

incompletus 300
indicus 279, **300**
inquilinus 262, **271**

japonicus 262, **288**

koebelei 261, **266,** 271
koyamai 259, 261, 300, **301**

laevis 259, 262, 263, 279, **281,** 293, 294, 295, 297, 298, 304, 305, 306, 308
lapponicus 262, **290**
laticeps 262, 263, 264, 279, **283,** 293, 294, 295, 296, 297, 298, 299, 303, 304, 305, 306, 308
latifrons 300
leucopidis 300
levis 281
lichtensteinii 259, 262, 279, **280**
liebscheri 262, 263, 264, 266, 271, **285,** 293, 295, 296, 299, 303, 304, 306, 307, 308
longicornis 262, **276**
lundensis 261, **266**

navaensis 262, **276**
neglectus 261, **266**
niger 262, **270**
noumeae 300

omostenus 301

pallipes 262, **276**
parvulus 262, **286**
piceus 262, **290**
pinicolus 300
propodealis 300
proximus 262, **270**
punctatipennis 262, 270, **271**
punctipes 258, 259, 261, 262, 263, 265, **286,** 299
puparum 287
pupparum 259, 260, 262, 264, 265, **287,** 298, 299, 301, 302, 304, 306, 307

ramicornis 256, 259, 260, 261, 262, 263, 265, **288,** 293, 295, 296, 298, 299, 302, 304, 305, 306
ratzeburgi 259, 262, **288**
rectangularis 262, **276**
remaudierei 300, **301**
rosularum 309
rufipes 261, 266, **267**
rufiventris 262, **270**

semiramosus 262, **290**
serraticornis 290
serricornis 260, 262, 263, 265, 267, **290,** 295, 297, 298, 299, 306, 307
smirnoffi 262, **281**
solarii 301
sordidipes 261, **269**
spissicornis 258, 260, 261, 262, 263, 264, **292,** 299, 303
subquadratus 261, 266, **267**
subramosus 262, **290**
subtruncatus 309
syrphidarum 262, **287**

tenuicornis 262, **285**
testaceimanus 262, **270,** 290
thomsoni 262, **271**
tischbeini 262, **271**
triticum 300

wollastoni 287

zetterstedti 262, **290**

British Museum (Natural History) Publications

Catalogue of the Diptera of the Afrotropical Region

Editor: R. W. Crosskey. *Assistant editors:* B. H. Cogan,
P. Freeman, A. C. Pont, K. G. V. Smith and the late H. Oldroyd.
British Museum (Natural History). 1980, 1437 pp. £55·00

The Diptera or two-winged flies are probably the most important insects that affect man. Although most flies are harmless, some have become transmitters of dangerous diseases to man and his domestic animals, and others are important pests of agricultural crops. Some flies are beneficial because they destroy large numbers of plant-feeding insects through their parasitic or predacious habits.

Nowhere is their socio-economic and medical impact more sharply felt than in tropical Africa, where fly-borne diseases are not only a direct health hazard but can prevent or hinder development of the land. The control of such diseases as sleeping sickness and onchocerciasis depends in great measure upon controlling the flies that carry them. This in turn requires a thorough appreciation of all that is known about the insect vectors, including their basic taxonomy, so that they can be correctly identified and their geographical ranges accurately established.

This catalogue synthesizes the scattered basic taxonomic work on the Diptera of tropical Africa and its islands by listing the known 16,500 species with their synonyms and known geographical ranges within a comprehensive classification. A short introduction is given to each family and a bibliography of 4,700 titles provides references to the primary literature. Such a task has never before been attempted for the region and its completion should greatly stimulate taxonomic research. The *Catalogue* represents ten years' careful work by a team of forty specialists, under the editorship of six dipterists on the staff of the Natural History Museum, themselves contributors with considerable expertise in the African fauna.

The *Catalogue* should serve for a long time as an indispensable tool to the taxonomist and an essential source-work to anyone concerned with African flies in the fields of medical, agricultural and veterinary science.

Titles to be published in Volume 41

A revision of the western Palaearctic species of the genus *Meteorus* (Hymenoptera: Braconidae). By T. Huddleston.

A revision of the Old World Polymorphanisini (Trichoptera: Hydropsychidae). By P. C. Barnard.

A review of the genera of Neotropical Encyrtidae (Hymenoptera: Chalcidoidea). By John S. Noyes.

A revision of the British species of *Dendrocerus* Ratzeburg (Hymenoptera: Ceraphronoidea) with a review of their biology as aphid hyperparasites. By N. D. M. Fergusson.

A revision of the Pacific species of *Conocephalus* Thunberg (Orthoptera: Tettigoniidae). By Linda M. Pitkin.

Printed by The Whitefriars Press Ltd, London and Tonbridge

Bulletin of the British Museum (Natural History)

BRITISH MUSEUM
GENERAL
23 DEC 1980
LIBRARY
NATURAL HISTORY

A revision of the Pacific species of *Conocephalus* Thunberg (Orthoptera: Tettigoniidae)

Linda M. Pitkin

Entomology series
Vol 41 No 5

18 December 1980

The *Bulletin of the British Museum* (*Natural History*), instituted in 1949, is issued in four scientific series, Botany, Entomology, Geology (incorporating Mineralogy) and Zoology, and an Historical series.

Papers in the *Bulletin* are primarily the results of research carried out on the unique and ever-growing collections of the Museum, both by the scientific staff of the Museum and by specialists from elsewhere who make use of the Museum's resources. Many of the papers are works of reference that will remain indispensable for years to come.

Parts are published at irregular intervals as they become ready, each is complete in itself, available separately, and individually priced. Volumes contain about 300 pages and are not necessarily completed within one calendar year. Subscriptions may be placed for one or more series. Subscriptions vary according to the contents of the Volume and are based on a forecast list of titles. As each Volume nears completion, subscribers are informed of the cost of the next Volume and invited to renew their subscriptions. Orders and enquiries should be sent to:

Publications Sales,
British Museum (Natural History),
Cromwell Road,
London SW7 5BD,
England.

World List abbreviation: *Bull. Br. Mus. nat. Hist.* (Ent.)

©Trustees of the British Museum (Natural History), 1980

This number completes Volume 41

ISSN 0524–6431

British Museum (Natural History)
Cromwell Road
London SW7 5BD

Entomology series
Vol 41 No 5 pp 315–355

Issued 18 December 1980

BRITISH MUSEUM
GENERAL
23 DEC 1980
LIBRARY
NATURAL HISTORY

A revision of the Pacific species of *Conocephalus* Thunberg (Orthoptera: Tettigoniidae)

Linda M. Pitkin K

Department of Entomology, British Museum (Natural History), Cromwell Road, London SW7 5BD

Contents

Synopsis 315
Introduction 315
Acknowledgements 316
Economic importance 316
Biogeography 317
Material 319
Methods 320
Conocephalus Thunberg 320
  Checklist of the Pacific species and subspecies of *Conocephalus* 323
  Key to the Pacific species of *Conocephalus* 323
  Descriptions of the Pacific species 329
References 353
Index 354

Synopsis

The species of *Conocephalus* Thunberg occurring on the Pacific islands are revised and three new species are described. Keys are given to the eighteen species recognized, and to their subspecies and forms. Eleven specific and subspecific synonyms are newly established, and a new name is proposed for a junior homonym. Accounts are given of the economic importance and biogeography. The songs of two of the species are described for the first time.

Introduction

I undertook this study as the result of an enquiry about the identity of *Conocephalus* species that had been found to be potentially useful in the biological control of a rice pest in Papua New Guinea (see p. 316). It soon became apparent that the specimens sent from Papua New Guinea could not be reliably identified until all the species of the genus occurring in the South Pacific had been revised. The geographical area covered by the study comprises the Pacific islands east of the Philippines and the Moluccas, extending northwards to the Tropic of Cancer and eastwards to the Marquesas Is. The countries and regions in this area from which I have examined material are listed in Table 1 (p. 318). Australia has a large number of endemic species, which I have excluded as being beyond the scope of the present study. I have examined 2150 Pacific specimens and many specimens from outside the Pacific area.

The genus *Conocephalus* was erected by Thunberg (1815) for 24 species; one of these, *Gryllus Tettigonia conocephalus* L., is regarded as the type-species by tautonymy. Many of the other species are now placed in the Copiphorinae. *Conocephalus* at present comprises approximately 100 valid named species in addition to the eighteen dealt with in the present study.

The prevalence of brachypterous and macropterous forms of the same species in *Conocephalus* has been misinterpreted by many earlier authors, who often regarded them as separate species. This source of confusion is evident in Redtenbacher's (1891) and Karny's (1907) revisions of the genus. Since 1907 there has been no comprehensive revision of *Conocephalus,* although partial revisions

Bull. Br. Mus. nat. Hist. (Ent.) **41** (5): 315–355 Issued 18 December, 1980

have covered the Neotropical (Rehn & Hebard, 1915*a*; 1915*b*) and Palaearctic (Harz, 1969) species, and new species have been described by various authors. Kaltenbach (1968) and Hudson (1972) have dealt with the species of New Caledonia and New Zealand, respectively, but these studies cover only a few of the species occurring in the Pacific; most of the remaining species have not been discussed in the literature since their original description.

There is one New Guinea species of *Conocephalus* which I have been unable to include in this study. This is *Xiphidion consul* Karny, 1911: 344 (type-locality: Sattelburg), the holotype of which is lost (pers. comm. from Dr A. Kaltenbach of the Naturhistorisches Museum, Vienna). Karny's description does not entirely agree with any of the specimens I have examined, and no further descriptive information on the species has been published by subsequent authors. I am therefore unable to determine the identity of *X. consul* Karny and consider it to be a nomen dubium.

Karny (1926: 181) records a specimen of *C. melaenus* (de Haan) from New Guinea. I consider this is likely to have been misidentified, and I have not included this species in the present study since its distribution is entirely extralimital to judge from the numerous specimens which I have examined.

A number of subgenera have been described for the species of *Conocephalus*. Some of these consist of only one or two species and some others are based on rather unreliable characters such as the presence or absence of certain hind tibial spurs. I have found this character to be useful at the specific level in the species I have studied, but even so it is subject to intraspecific variation. Two of the three new species described in this paper are intermediate between two subgenera on the basis of this character, and I have therefore decided not to assign any species to subgenera. (See also p. 320.)

Acknowledgements

I would like to thank the following specialists who have lent me material for this study from their respective institutions:

Dr C. Baroni Urbani, Dr P. H. van Doesburg, Dr M. Donskoff, Dr C. E. Dunn, Dr K. K. Günther, Dr B. Hauser, Dr A. Kaltenbach, Dr T. Kronestedt, Dr G. M. Nishida, Dr D. C. F. Rentz, Dr J. N. L. Stibick, Miss A. K. Walker, and Dr F. Willemse.

I also particularly wish to thank Dr D. R. Ragge for his most helpful advice and criticism in the course of this study; Dr M. H. Robinson for sending me live specimens, some of which were used for making tape recordings of the songs; Mr W. J. Reynolds for invaluable assistance in making the song recordings and preparing the oscillograms used in this study, and for testing the identification keys; and Mr G. Young for information on the biology of some *Conocephalus* species.

Economic importance

Two species of *Conocephalus*, subsequently identified by me as *C. redtenbacheri* (Bolívar) and *C. semivittatus vittatus* (Redtenbacher), have been found to be important predators of eggs and nymphs of a serious rice pest, *Leptocorisa oratorius* (F.) (Hemiptera: Alydidae), in Papua New Guinea. According to Sands (1977) these species do not appear to damage the developing rice grains or eat any part of the rice plant apart from feeding to some extent on the stamens (together with other grass flowers) and should therefore be considered distinctly beneficial. In New Guinea, *C. redtenbacheri* is by far the more common of the two, judging from the specimens I have examined. Both species have also been recorded as preying on eggs of other Hemipteran pests: *Riptortus annulicornis* Bois (Alydidae) and *Nezara viridula* L. (Pentatomidae) (pers. comm. from Dr G. Young of the Department of Primary Industry, Konedobu).

C. saltator (Saussure) has also been reported as a predator of pests, by Zimmerman (1948) and Swezey (1905, under the synonym *Xiphidium varipenne* Swezey). It has been found in abundance in the sugar cane fields of the Hawaiian Is., feeding largely on young and adult sugar cane leafhoppers, *Perkinsiella saccharicida* Kirkaldy; the sugar cane bud moth, *Decadarchis flavistriata* (Walsingham) (formerly in *Ereunetis*), and other caterpillars; the coccid *Dymisococcus brevipes* (Cockerell) (formerly in *Pseudococcus*); and dipterous larvae. Swezey states that there is very little evidence of this species eating cane, although it will eat pollen from the blossoms of *Canna*, *Lantana* and other plants. *C. saltator* is also considered to be a valuable predator of pineapple mealy bugs, and of the caterpillars and pupae of various bud moths which are pests of pineapples (see Illingworth, 1929: 256).

Although *C. saltator* appears to be chiefly beneficial, it has been reported as causing some damage to rice in the West Indies (Grist & Lever, 1969: 293). In the Pacific, it has been known to do so only occasionally. It has also caused occasional damage to corn and pineapples; in the latter case the damage is caused by laying its eggs in the flowers of the young fruit (Zimmerman, 1948).

C. longipennis (de Haan) and an unidentified *Conocephalus* species were recorded as feeding on nymphs and probably eggs of the rice ear bug, *Leptocorisa oratorius* (F.), in Sarawak by Rothschild (1970). He states, however, that in these particular species the beneficial effect is probably largely nullified by their habit of feeding on developing rice grains. In fact, *C. longipennis* has been recorded as a minor pest of rice in Sarawak and New Guinea by Grist & Lever (1969: 293), although I have not seen any specimens, or other record, of the species from New Guinea. It is common on rice in W. Java, where a specimen has been observed eating an unidentified insect (Kalshoven & van der Vecht, 1950: 137). This species also occurs on rice in Malaya (Yunus, 1967), the Philippines, India and Bangladesh (specimens examined). I have seen specimens of *C. oceanicus* (Le Guillou), also collected from rice in the Philippines.

Various *Conocephalus* species, not included in the present study, have been recorded as pests of rice by Grist & Lever (1969: 292–293). These are *C. cinereus* (Thunberg) in Surinam, *C. propinquus* (Redtenbacher) in Guyana and Surinam, and *C. fasciatus* (De Geer) in Texas, U.S.A. This last species is known to be insectivorous as well (Marshall, 1964). I have seen specimens of *C. conocephalus* (L.), collected from rice in West Africa, where it feeds on some plant material and probably also eats the immature stages of a rice pest, *Aleurocybotus* ? *indicus* David (Hemiptera: Aleyrodidae) (pers. comm. from Mr J. C. Deeming).

It would therefore appear that *Conocephalus* species are often both predacious and herbivorous. Where they occur on plants of economic importance, species which are predominantly predacious can be very beneficial, while predominantly herbivorous species may be pests.

Biogeography

The species of *Conocephalus* in the Pacific can be divided into two groups on the basis of two quite different male characters. In one group the species have cerci with one internal spine and a small structure slightly basad of this as shown in Figs 2–11, hereafter referred to as a tubercle. They also have a stridulatory file with the row of teeth differentiated into large, well-spaced teeth at one end and tiny dense teeth at the other end (Figs 45, 46). In the other group the species have one, or in one case two, internal spines on the cerci but no tubercle; the stridulatory file is shaped as in Fig. 47, with comparatively uniform density and size of teeth. I am including *C. upoluensis* (Karny) and *C. albescens* (Walker) in the first group on the basis of their stridulatory file shape, although the tubercle of the cerci of these two species is extremely small or sometimes absent. One species, *C. tridens* Hebard, is intermediate between the two groups in the stridulatory file structure and the cerci are unique in the genus in having three internal spines. This species is endemic in the Marquesas Is. and does not seem to be related to any of the other Pacific species.

The species of the first group are known only from the Pacific and nearby islands such as the Moluccas (with the exception of a record of *C. oceanicus* from Vietnam) but most of the species in the second group have distributions extending well outside the Pacific, in several cases in Asia, and in two species also in tropical Africa, although they show no evidence of southern Gondwanaland relationships. One of the species in the second group, *C. saltator,* is known to have been introduced to the Pacific, and I think it is likely that most of the species in this group originated outside the Pacific since they lack characters shared by the species known only from the Pacific.

The distribution patterns of the *Conocephalus* species in the Pacific (Table 1) suggest that their dispersal has been largely achieved by flight. Most of the species that are at least sometimes macropterous occur on two or more islands and some are widespread in the Pacific. One of these species, *C. angustivertex* sp. n., is recorded only from New Guinea, but *C. bispinatus* sp. n. also occurs outside the Pacific, and *C. tridens,* although restricted to the Marquesas, occurs on several

Table 1 The distribution of the species of *Conocephalus* in the Pacific

	oceanicus	*starmuehlneri*	*redtenbacheri*	*infumatus*	*semivittatus semivittatus*	*semivittatus vittatus*	*tumidus*	*trivittatus*	*upoluensis*	*albescens*	*bilineatus*	*maculatus*	*laetus*	*angustivertex*	*saltator*	*longipennis*	*willemsei*	*bispinatus*	*tridens*
Hawaiian Is.															+				
Marquesas Is.	+																		+
Tubuai Is.	+																		
Society Is.	+							+											
Cook Is.	+								+						+				
Line Is.															+				
Tonga Is.	+								+										
American Samoa	+								+						+	+			
Western Samoa	+								+						+				
Fiji Is.	+								+										
Ellice Is.	+																		
Caroline Is.																+			
New Zealand					+					+	+								
Kermadec Is.					+														
Norfolk I.									+										
Lord Howe I.					+					+									
Loyalty Is.									+										
New Caledonia	+	+							+										
New Hebrides	+					+			+										
Solomon Is.			+	+		+			+										
New Britain; New Ireland			+	+		+			+										
Admiralty Is.			+			+													
Southern Australia					+				+	+	+								
Northern Australia			+			+			+			+	+				+		
Papua New Guinea	+		+			+	+		+			+	+	+			+	+	
Irian Jaya			+			+			+			+	+	+					

islands in this group. On the other hand, each of the three species known solely from brachypterous specimens, *C. starmuehlneri* Kaltenbach, *C. tumidus* sp. n. and *C. trivittatus* (Stål), is recorded from only one island. Some dispersal is still taking place, for example the spread of *C. saltator* to the Line Is., Samoa and the Cook Is., following its introduction to the Hawaiian Is. from America in *c.* 1890.

The distribution patterns of Pacific *Conocephalus* species do not support a rigid system of biogeographical division of the Pacific. They show only slight evidence for the two Melanesian arcs discussed by Ross (1956), Hennig (1966) and other authors. *C. upoluensis* has an outer Melanesian arc distribution pattern in that it occurs from New Guinea to the Solomon Is., the New Hebrides, Fiji and Samoa, but it also occurs in New Caledonia and elsewhere in the Pacific. *C. redtenbacheri* and *C. semivittatus vittatus* occur from New Guinea to the Solomon Is. and to the New Hebrides respectively, but do not extend further. None of the species have the inner Melanesian arc distribution linking New Guinea, New Caledonia and New Zealand.

However, the distributions of the *Conocephalus* species do support the existence of some points of partial discontinuity between certain islands or island groups. Lee (1975) and other authors consider there to be a distinction between the biota of the Solomon Is. and the New Hebrides. This is supported in the present study by *C. redtenbacheri* and *C. infumatus* (Redtenbacher) which reach the eastern limit of their distribution in the Solomon Is. (including the Santa Cruz Is.) and *C. oceanicus* which occurs in the New Hebrides but has not been found in the Solomon Is. The present study corroborates the biogeographical inclusion of the Santa Cruz Is. in the Solomon Is. *C. upoluensis* occurs in both the Solomon Is. and the New Hebrides; however, this species is very widespread in the Pacific. *C. semivittatus vittatus* also occurs in both these island groups, but although it occurs in most of the northern islands of the New Hebrides, it has not been found in Erromango or the other islands south of Efate. This tends to corroborate Lee's suggestion of a major disjunction between Efate and Erromango separating the northern and southern New Hebrides.

There is also some differentiation between the *Conocephalus* occurring in northern Australia (Northern Territory and Queensland) and southern Australia; all except the widespread *C. upoluensis* are restricted to one or other region of Australia. This shows agreement with Gressitt (1961) and Thorne (1963). All the *Conocephalus* species found in northern Australia also occur in New Guinea. The species in southern Australia, other than *C. upoluensis,* also occur in New Zealand.

New Caledonia has been noted as having a high degree of endemism by authors including van Balgooy (1971) and Thorne (1963). In the present study one species, *C. starmuehlneri* Kaltenbach, is endemic in New Caledonia and probably arose from the ancestry of its close relative *C. oceanicus,* whose distribution includes New Caledonia.

Material

The material examined in this study is deposited in the following institutions.

BMNH	British Museum (Natural History), London
DSIR, Auckland	Department of Scientific and Industrial Research, Auckland
NM, Basle	Naturhistorisches Museum, Basle
MNHU, Berlin	Museum für Naturkunde der Humboldt-Universität, Berlin
ANIC, Canberra	Australian National Insect Collection, Canberra
MHN, Geneva	Muséum d'Histoire Naturelle, Geneva
BPBM, Honolulu	Bernice P. Bishop Museum, Honolulu
HSDA, Honolulu	Hawaii State Department of Agriculture, Honolulu
DPI, Konedobu	Department of Primary Industry, Konedobu, Papua New Guinea
RNH, Leiden	Rijksmuseum van Natuurlijke Historie, Leiden
NM, Maastricht	Natuurhistorisch Museum, Maastricht
MNHN, Paris	Muséum National d'Histoire Naturelle, Paris
ANS, Philadelphia	Academy of Natural Sciences of Philadelphia
NR, Stockholm	Naturhistoriska Riksmuseet, Stockholm
NM, Vienna	Naturhistorisches Museum, Vienna

Methods

All the morphological data were taken from dried adult specimens. The measurements given for all the previously described species were taken from Pacific specimens only (see Table 1 for summary of provenances), although specimens from the complete ranges were examined, when available, for other characters. In most species all the available Pacific specimens were measured; in the rest the measurements were taken from samples of at least 20 specimens of each sex of every species, subspecies or form, selected to cover a wide range of localities. Primary types from outside the Pacific were measured, although not included in the samples. Any measurements of these types outside the range given for any character has been noted under the relevant species.

Vernier callipers were used for all the measurements except the width of the fastigium, the male cercal length and the length of the stridulatory area, which were measured using a microscope with a moving stage vernier micrometer. Forewing length was measured on the flexed left wing, from where the pronotum overlaps the veins *Sc* and *R* to the apex. Ovipositor length was measured from the apex of the subgenital plate to the apex of the ovipositor. The length of the stridulatory area was measured as indicated in Fig. 39; male cercal length was measured on the right cercus, viewed laterally. Fastigium width was measured at the apex of the fastigium of the vertex, viewed dorsally. All the measurements listed are given in millimetres and the number of specimens measured is given in parentheses.

Pyroxylin replicas were made in order to examine the stridulatory structures of the under surface of the left male forewing, following the method described by Ragge (1969: 172). Although it has proved extremely useful in some recent taxonomic studies of Tettigoniidae, the stridulatory file was of no help in the present study in distinguishing closely related species; however, the presence or absence of spinules around the file was sometimes useful.

The drawings of stridulatory files and whole forewings were prepared by tracing the projected image from a microprojector and a photographic enlarger respectively. A camera lucida attachment to a microscope was used for all the other drawings.

In this study the term 'macropterous' refers to specimens in which the hind wings extend beyond the forewings (when both pairs of wings are flexed); 'brachypterous' refers to those in which the hindwings are shorter than the forewings. The wing-venation terminology was taken from Ragge (1955).

All the distribution records are based on material I have examined, to avoid the possibility of including incorrect records due to mistaken identity. For most of the species I have been able to examine large numbers of specimens and in these cases I have abbreviated the data listed under 'Material examined', omitting collectors' names and abbreviating the dates to the months only. Where the species has been previously recorded from the country or island group concerned, I have given only the name of the country (or its major subdivision) or island without further details. For new records of a species from a country or island group I have given the locality data in full, except for sometimes abbreviating repeated localities to their initial letters. The data of type-material is always given in full. The term 'Island' is omitted following individual island names listed after an island group except in cases where this omission might lead to confusion.

For material from outside the main area studied I have listed only the countries or islands, or sometimes only the zoogeographical region. The data of primary types from extralimital localities is, however, always given in full.

Studio recordings were made of the songs of two of the species included in this study, by Mr W. J. Reynolds, Dr D. R. Ragge and myself, using a Kudelski Nagra IVD tape recorder and Sennheiser MKH 405 microphone. The oscillograms shown in Figs 48 and 49 were made from these recordings using a Mingograf 34T.

CONOCEPHALUS Thunberg

Conocephalus Thunberg, 1815: 214. Type-species: *Gryllus Tettigonia conocephalus* L., by tautonymy.

Ten subgenera of *Conocephalus* are currently regarded as valid by at least some authors. Of these only the following three have had any of the species included in this study assigned to them. (See also remarks on p. 316.)

Subgenus ***CONOCEPHALUS*** Thunberg, 1815: 214.
Hebard (1933) states in his description of *C. tridens* that the species may be referable to this subgenus.

Subgenus ***ANISOPTERA*** Latreille, 1827: 409. Type-species: *Locusta dorsalis* Latreille, by subsequent designation (Kirby, 1906: 274).

Xiphidion Serville, 1831: 159. Type-species: *Locusta fusca* F., by subsequent designation (Kirby, 1906: 274). [Synonymized by Kirby, 1906: 274.]

Xiphidium Burmeister, [1838]: 707. [Unjustified emendation.]

Neoxiphidion Karny, 1912: 8. Type-species: *Locusta fasciata* De Geer, by subsequent designation (Rehn & Hebard, 1915*a*: 157). [Synonymized by Rehn & Hebard, 1915*a*: 170.]

Thecoxiphidion Karny, 1912: 12. Type-species: *Xiphidium strictum* Scudder, by subsequent designation (Rehn & Hebard, 1915*a*: 157). [Synonymized by Rehn & Hebard, 1915*a*: 170.]

Species included in the present study which have been assigned to the subgenus *Anisoptera* (or its junior synonyms) by previous authors: *C. oceanicus* (Le Guillou): *C. starmuehlneri* Kaltenbach; *C. semivittatus* (Walker); *C. bilineatus* (Erichson)[1]; *C. maculatus* (Le Guillou); *C. laetus* (Redtenbacher); *C. saltator* (Saussure); *C. longipennis* (de Haan).

Subgenus ***CHLOROXIPHIDION*** Hebard, 1922: 242. Type-species: *Xiphidium javanicum* Redtenbacher, by original designation.
Only one of the species included in the present study has been assigned to this subgenus by previous authors: *C. upoluensis* (Karny).

GENERIC DIAGNOSIS. ♂ ♀. Small to medium-sized Conocephalinae. Pronotum not produced backwards to cover stridulatory file. Prosternum unarmed or bispinose. Macropterous or brachypterous. Stridulatory area of left male forewing comparatively small. Fore and mid tibiae with 4–12 external (and similar number of internal) ventral spurs (usually 6). Mid femora usually unarmed, but occasionally (*C. bispinatus*) with externoventral spines. Hind femora unarmed or with externoventral (and occasionally also internoventral) spines. Male tenth abdominal tergite usually with two median projections at apex; otherwise truncate. Male cerci with 1–3 internal spines (one species, *C. bituberculatum* (Redtenbacher), is described as having no internal cercal spines). Male subgenital plate with wide, usually shallow, V-shaped incision, or truncate. Ovipositor straight or occasionally curved, of variable length.

DISCUSSION. Apart from *Conocephalus*, only two Conocephaline genera occur in the Pacific: *Fatuhivella* and *Nukuhivella*, both originally described by Hebard (1933) from the Marquesas Is., where they are endemic. These two genera, unlike *Conocephalus*, have the pronotum produced backwards in both sexes, so that in the male it covers the stridulatory organ; the males also have exceptionally specialized cerci.

One of the most striking features of the genus is the variation in wing length. Of the 18 species in the present study, nine are apparently always macropterous, three are known only from brachypterous specimens, and the rest have both forms. Of the species in the last category, some are strictly dimorphic without intermediates, notably *C. angustivertex*, while others show an almost continuous range of wing length, as in *C. redtenbacheri* and *C. saltator*. In *Conocephalus* variation in wing length within a species is in many cases correlated with variation in the size of the stridulatory area and the size of the cells formed by the forewing venation.

The genus is moderately uniform in general appearance apart from the wing length, but there are often clear differences between the species. Most of the Pacific species are easily distinguished from all the others, but there are a few species which form close-knit groups on the basis of morphological similarity. Two such species are *C. upoluensis* and *C. albescens*. A more complex group consists of *C. oceanicus, C. starmuehlneri, C. redtenbacheri* and *C. infumatus* (see under the discussions of these species). The taxa in this group, including the two forms of one of the species, show quite a strong tendency to be allopatric (see Fig. 1 and Table 1) and could possibly all be regarded as semispecies. The subspecies and forms of *C. semivittatus* (Walker) could also be semispecies.

DISTRIBUTION (Table 1). *Conocephalus* has a worldwide distribution between approximately 60°N and 45°S.

---

[1] Placed here by Karny (1912: 11) but would now be assigned to *Chloroxiphidion* Hebard.

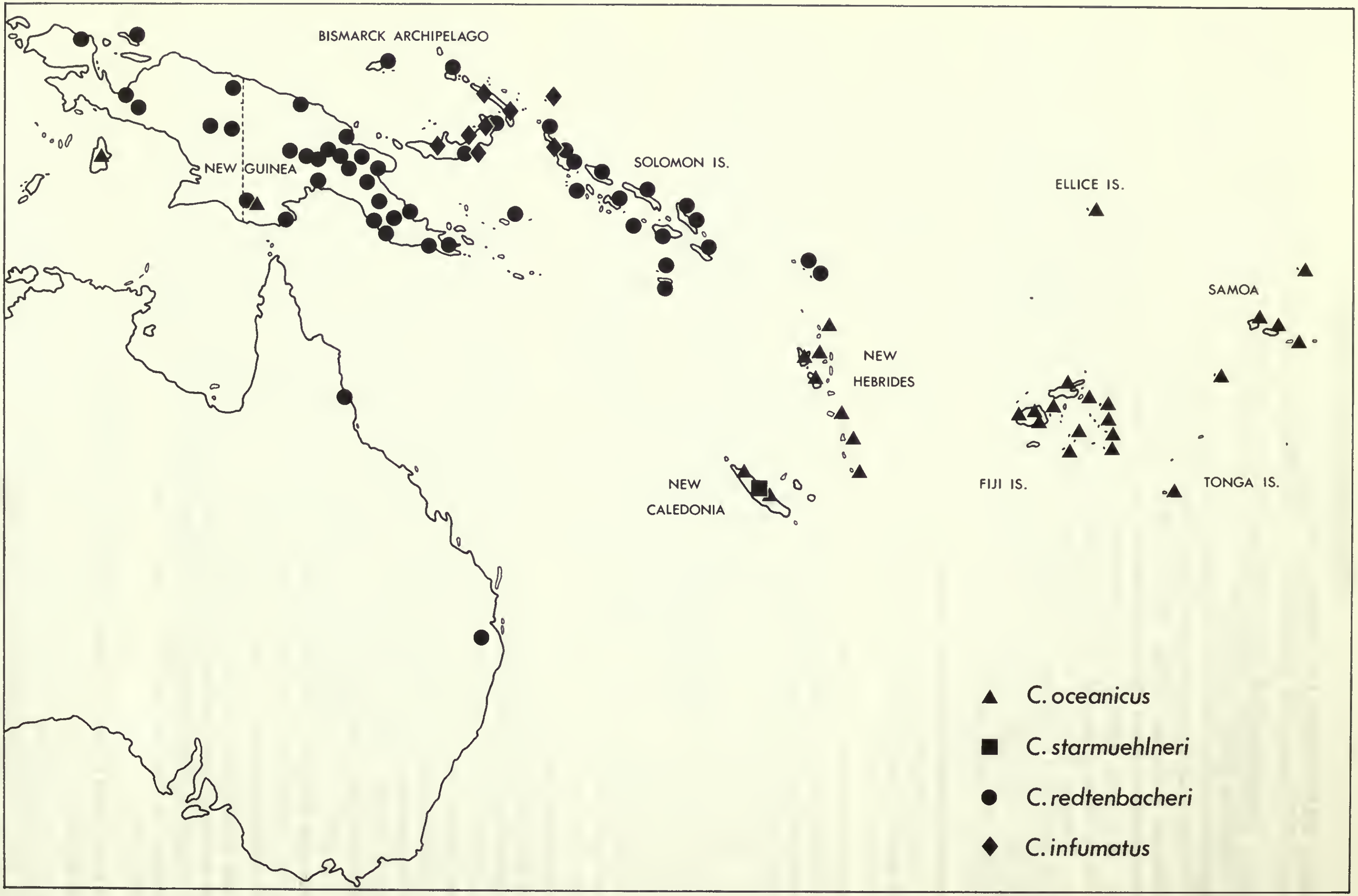

BISMARCK ARCHIPELAGO
NEW GUINEA
SOLOMON IS.
ELLICE IS.
SAMOA
NEW HEBRIDES
NEW CALEDONIA
FIJI IS.
TONGA IS.
▲ C. oceanicus
■ C. starmuehlneri
● C. redtenbacheri
◆ C. infumatus

Fig. 1 Map showing the distribution of four species of *Conocephalus* in an area of the Pacific (sinusoidal projection).

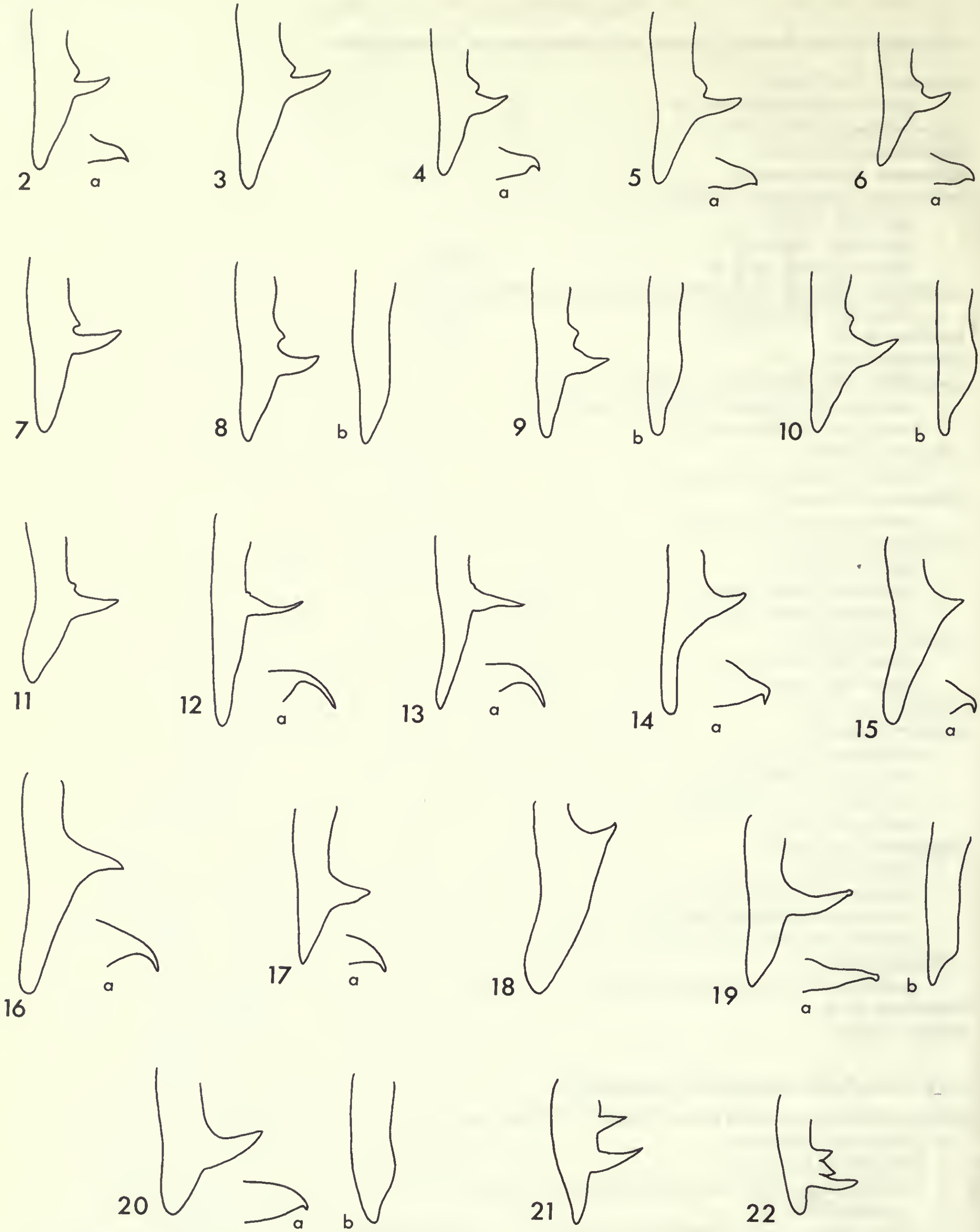
Checklist of the Pacific species and subspecies of *Conocephalus*

oceanicus (Le Guillou)
  affine Redtenbacher **syn. n.**
starmuehlneri Kaltenbach
redtenbacheri (Bolívar)
infumatus (Redtenbacher)
semivittatus semivittatus (Walker)
  maoricum Walker
  antipodum Scudder
  brunneri Karny **syn. n.**
semivittatus vittatus (Redtenbacher) **nom. rev., stat. n.**
  geniculare Redtenbacher
tumidus **sp. n.**
trivittatus (Stål)
upoluensis (Karny) **nom. rev., stat. n.**
  modestum Redtenbacher (junior homonym)
  brevixiphus Willemse **syn. n.**
albescens (Walker)
  latifrons Redtenbacher **syn. n.**
bilineatus (Erichson)
  immaculatum Karny **syn. n.**
maculatus (Le Guillou)
  lepida de Haan
  continuum Walker **syn. n.**
  neglectum Bruner **syn. n.**
laetus (Redtenbacher)
  dubius Willemse **syn. n.**
  raggei Harz **syn. n.**
angustivertex **sp. n.**
saltator (Saussure)
  meridionale Scudder
  propinquum Redtenbacher
  brachypterum Redtenbacher
  varipenne Swezey
longipennis (de Haan)
  spinipes Stål
  longicorne Redtenbacher
  carolinensis Willemse **syn. n.**
  carolinensis f. *macroptera* Willemse **syn. n.**
willemsei **nom. n.**
  ensiferus Willemse (junior homonym)
bispinatus **sp. n.**
tridens Hebard

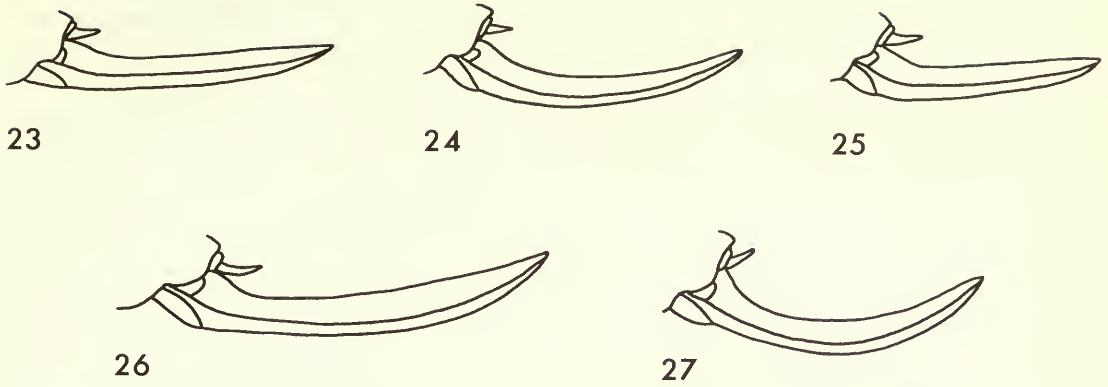
Key to the Pacific species of *Conocephalus*

Measurements given in this key are taken from Pacific specimens and may differ for extralimital material.

1 Prosternum unarmed 2
– Prosternum bispinose 3
2 Hind femora armed ventrally with spines. Male cerci with 2 internal spines (Fig. 21). Ovipositor straight (Fig. 25) . . . . *C. **bispinatus*** sp. n. (p. 351)
– Hind femora unarmed ventrally. Male cerci with 3 internal spines (Fig. 22). Ovipositor curved (Fig. 27) . . . . *C. **tridens*** Hebard (p. 352)
3 Hind femora unarmed ventrally 4
– Hind femora with externoventral spines 12
4 Forewings unicolorous. Ovipositor at least 13·7 mm long. Stridulatory area of left male forewing large (at least 2·7 mm long, measured as in Fig. 39) . . *C. **laetus*** (Redtenbacher) (p. 345)
– Forewings usually with some spots or other markings. If unicolorous, ovipositor not more than 13·2 mm long. Stridulatory area of left male forewing smaller (not more than 2·3 mm long) 5



Figs 2–22 Dorsal view of the left male cercus, and in some cases (a) posterior view of the internal spine and (b) externolateral view of the cercus of (2) *Conocephalus oceanicus*; (3) *C. starmuehlneri*; (4) *C. redtenbacheri*; (5) *C. infumatus* (typical form); (6) *C. infumatus* (small New Ireland form); (7) *C. semivittatus semivittatus*; (8) *C. semivittatus vittatus* (typical form); (9) *C. semivittatus vittatus* (small form); (10) *C. tumidus*; (11) *C. trivittatus*; (12) *C. upoluensis*; (13) *C. albescens*; (14) *C. bilineatus* (15) *C. maculatus*; (16) *C. laetus*; (17) *C. angustivertex*; (18) *C. saltator*; (19) *C. longipennis*; (20) *C. willemsei*; (21) *C. bispinatus*; (22) *C. tridens*.



Figs 23–27 Lateral view of the ovipositor of (23) *Conocephalus tumidus*; (24) *C. angustivertex*; (25) *C. bispinatus*; (26) *C. willemsei*; (27) *C. tridens.*

5 Forewings with large dark spots; no markings in the costal or precostal areas (Fig. 31) . . . . *C. maculatus* (Le Guillou) (p. 344)

– Forewings with dark pigmentation in the costal and precostal areas, with or without comparatively small spots on the rest of the wing (Figs 29, 30, 32); or unicolorous 6

6 Hind tibiae with 3 pairs of apical spurs (Fig. 40). Forewings unicolorous, or, if with dark markings, cross-veins of the costal and precostal forewing areas regular, parallel . . . 7

– Hind tibiae usually with 2 pairs of apical spurs (ventral pair missing). If with 3 pairs of spurs: forewings with dark markings at least in the costal and precostal areas, although occasionally very faint; cross-veins of the costal and precostal forewing areas irregular, often reduced 8

7 Forewings unicolorous. Male cerci shaped as in Fig. 18, with one internal spine . . . . *C. saltator* (Saussure) (p. 347)

– Forewings with some darker pigmentation in the costal and precostal areas, as in Fig. 29, although sometimes faint. Male cerci shaped as in Fig. 11, with one internal spine and one tubercle . . . . *C. trivittatus* (Stål) (p. 340)

8 Brachypterous; forewing length not more than 6·1 mm 9

– Macropterous or brachypterous; forewing length at least 8·0 mm 10

9 Male cerci with one internal spine and one tubercle (Fig. 10). Ovipositor length not more than 8·5 mm . . . . *C. tumidus* sp. n. (p. 339)

– Male cerci with one internal spine (Fig. 14). Ovipositor length at least 10·5 mm . . . . *C. bilineatus* (Erichson) (p. 343)

10 Fastigium of the vertex relatively narrow (at most 0·57 mm). Forewings with dark pigmentation only in the costal and precostal areas, as in Fig. 29. Male cerci shaped as in Fig. 14 . . . . *C. bilineatus* (Erichson) (p. 343)

– Fastigium of the vertex relatively wide (at least 0·59 mm). Forewings with dark pigmentation in the costal and precostal areas, and usually with some small spots on the rest of the wing (Fig. 30). Male cerci shaped as in Figs 12, 13 11

11 Male cerci very slender in the apical part (Fig. 13). Male tenth abdominal tergite produced perpendicularly downwards (Fig. 42). Ovipositor length at least 11·8 mm . . . . *C. albescens* (Walker) (p. 342)

– Male cerci less slender in the apical part (Fig. 12). Male tenth abdominal tergite nearly unmodified, or slightly produced at apex but not bent downwards (Fig. 41). Ovipositor length not more than 11·0 mm . . . . *C. upoluensis* (Karny) (p. 341)

12 Males 13

– Females 23

13 Cerci with one internal spine (Figs 17–20) 14

– Cerci with one internal spine and one tubercle (Figs 2–10) 17

14 Forewings unicolorous. Hind tibiae with 6 apical spurs (Fig. 40) 15

– Forewings with dark pigmentation as in Fig. 32. Hind tibiae usually with 5 apical spurs (internodorsal spur missing; very rarely a small 6th spur is present) . . . . *C. angustivertex* sp. n. (p. 346)

15 Cerci shaped as in Fig. 18, with internal spine near base. Width of fastigium of the vertex at least 0·42 mm . . . . ***C. saltator*** (Saussure) (p. 347)

– Cerci shaped as in Figs 19, 20, with internal spine in the middle or towards the apex. Width of fastigium of the vertex not more than 0·37 mm 16

16 Internal cercal spine with a globular apex. Cerci comparatively slender, shaped as in Fig. 19 . . . . ***C. longipennis*** (de Haan) (p. 349)

– Internal cercal spine with a pointed apex. Cerci usually comparatively stout, shaped as in Fig. 20 . . . . ***C. willemsei*** nom. n. (p. 350)

17 Forewings with dark pigmentation in the costal and precostal areas (Figs 28, 29). Fastigium of the vertex comparatively wide (0·52–0·93 mm) 18

– Forewings without dark pigmentation in the costal or precostal areas. Fastigium of the vertex comparatively narrow (0·23–0·53 mm) 19

18 Cerci as in Figs 7–9; comparatively straight or only slightly bulging in profile. Hind tibiae with 6 apical spurs . . . . ***C. semivittatus*** (Walker) (p. 335)

– Cerci as in Figs 10, conspicuously bulging in profile. Hind tibiae usually with 4 apical spurs (ventral pair missing) . . . . ***C. tumidus*** sp. n. (p. 339)

19 Brachypterous 20

– Macropterous 21

20 *R* and *Sc* of forewings at most only very slightly darkened; very rarely darkened towards the base. Forewings comparatively wide, tapering comparatively abruptly towards the apex (Fig. 33). Length of cerci at least 1·8 mm; internal spine with a gradually curved apex as in Fig. 2a . . . . ***C. starmuehlneri*** Kaltenbach (p. 330)

– *R* and *Sc* of forewings usually darkened, at least towards the base. Forewings comparatively narrow, tapering gradually towards the apex (Fig. 34). Length of cerci not more than 1·7 mm; internal spine with a hook-shaped apex (Fig. 4a) . . ***C. redtenbacheri*** (Bolívar) (p. 331)

21 Forewings unicolorous. Internal cercal spine with a gradually curved apex (Fig. 2a). Width of fastigium of the vertex at least 0·4 mm . . . . . ***C. oceanicus*** (Le Guillou) (p. 329)

– *R* and *Sc* of forewings usually darker than the rest of the wings, at least towards the base. If not, internal cercal spine with a hook-shaped apex (Fig. 4a), or width of fastigium of the vertex not more than 0·3 mm 22

22 Internal cercal spine with a gradually curved apex (Figs 5a, 6a). Stridulatory file usually with few surrounding spinules, as in Fig. 45 . . . . . ***C. infumatus*** (Redtenbacher) (p. 333)

– Internal cercal spine with a hook-shaped apex (Fig. 4a). Stridulatory file surrounded by many spinules, as in Fig. 46 . . . . ***C. redtenbacheri*** (Bolívar) (p. 331)

23 Forewings with dark pigmentation at least in the costal and precostal areas as in Figs 28, 29, 32 24

– Forewings unicolorous or with dark pigmentation only outside the costal and precostal areas 26

24 Ovipositor gently curved (Fig. 24). Hind tibiae with 5 apical spurs (internodorsal spur missing; very rarely a small 6th spur is present). Width of fastigium of the vertex not more than 0·4 mm . . . . ***C. angustivertex*** sp. n. (p. 346)

– Ovipositor comparatively straight (Fig. 23). Hind tibiae with 3–6 apical spurs. Width of fastigium of the vertex at least 0·5 mm 25

25 Hind tibiae with 6 apical spurs. Width of fastigium of the vertex 0·52–0·83 mm. Subgenital plate with an excised or truncate apex; if truncate, width of fastigium of the vertex not more than 0·81 mm . . . . ***C. semivittatus*** (Walker) (p. 335)

– Hind tibiae usually with not more than 4 apical spurs (ventral pair missing or small). Width of fastigium of the vertex 0·83–0·91 mm. Subgenital plate with a truncate apex . . . . ***C. tumidus*** sp. n. (p. 339)

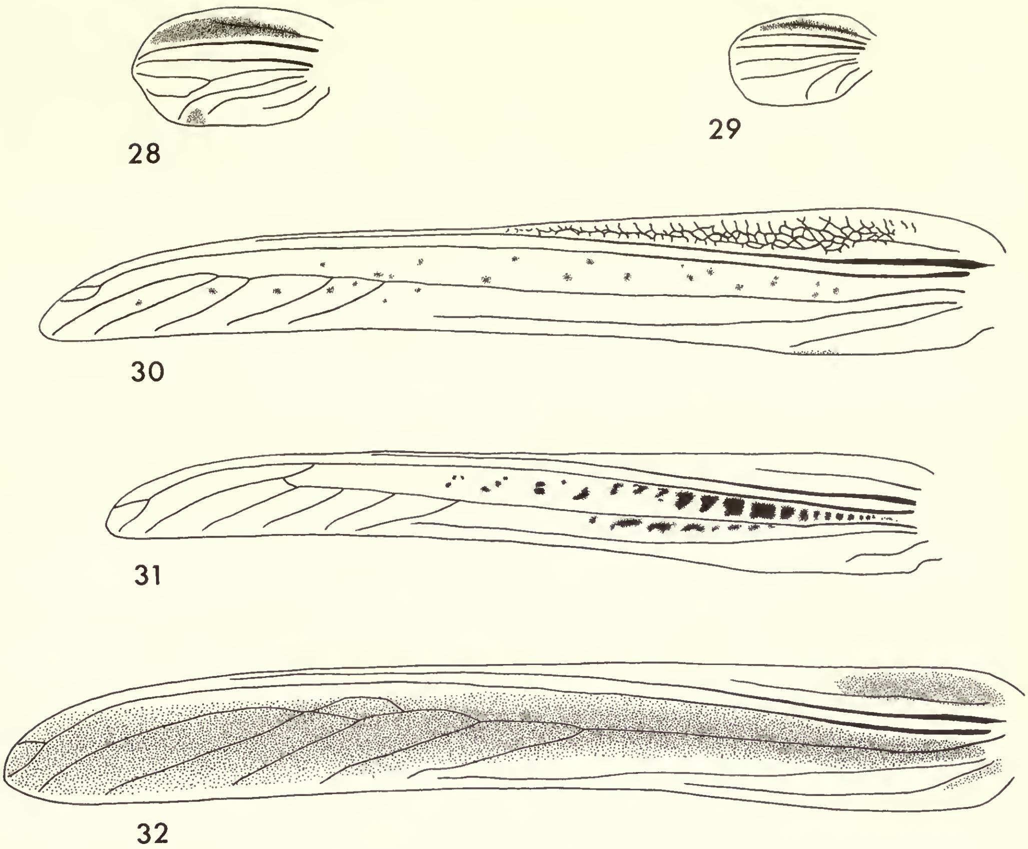
26 Forewing length at least 24·0 mm. Ovipositor comparatively broad as in Fig. 26 . . . . ***C. willemsei*** nom. n. (p. 350)

– Forewing length not more than 22·5 mm. Ovipositor comparatively narrow, not shaped as in Fig 26 27

27 *R* and *Sc* of forewings usually darkened at least towards the base; if brachypterous, forewings comparatively narrow, tapering gradually towards the apex (Fig. 34) 28

– Forewings unicolorous or almost so; *R* and *Sc* at most only very slightly darkened, very rarely towards the base. If *R* and *Sc* slightly darkened; brachypterous, forewings comparatively wide, tapering comparatively abruptly towards the apex (Fig. 33) 29

28 Ratio of the pronotum length to the width of fastigium of the vertex at most 8·8 mm. Macropterous or brachypterous . . . . . . ***C. redtenbacheri*** (Bolívar) (p. 331)



Figs 28–32 The left female forewing of (28) *Conocephalus semivittatus vittatus* (typical form) (brachypterous); (29) *C. tumidus*; (30) *C. upoluensis*; (31) *C. maculatus*; (32) *C. angustivertex* (macropterous). Macropterous and brachypterous specimens of the same species have a similar pigmentation.

— Ratio of the pronotum length to the width of fastigium of the vertex at least 9·0 mm. Macropterous . . . . *C. infumatus* (Redtenbacher) (p. 333)

29 Brachypterous. Subgenital plate with a slightly excised apex (Fig. 43) . . . . *C. starmuehlneri* Kaltenbach (p. 330)

– Mostly macropterous. If brachypterous, subgenital plate with a truncate apex (Fig. 44) . 30

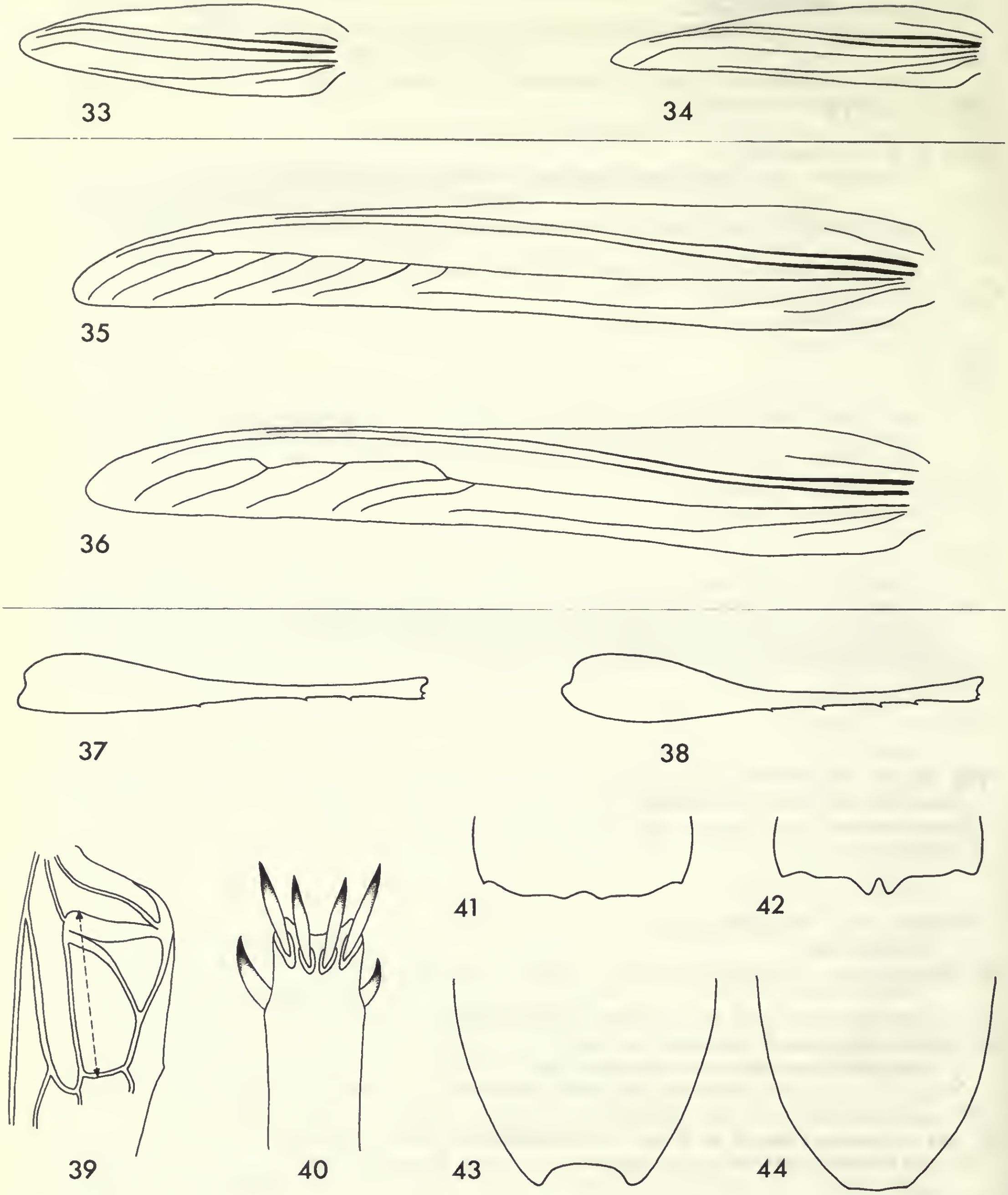
30 Width of fastigium of the vertex not more than 0·42 mm. Ovipositor length at least 12·5 mm. Subgenital plate with a widely excised apex . . . *C. longipennis* (de Haan) (p. 349)

– Width of fastigium of the vertex more than 0·42 mm, or, if less than 0·42 mm, ovipositor length not more than 11·5 mm. Subgenital plate with a truncate or shallow excised apex . 31

31 *MA* of forewings shaped as in Fig. 35. Macropterous. Hind femora gradually swollen towards the base (Fig. 37). Ovipositor length 8·3–11·1 mm. Subgenital plate with a shallow excised apex . . . . *C. oceanicus* (Le Guillou) (p. 329)

– *MA* of forewings shaped as in Fig. 36 (macropterous). Macropterous or brachypterous. Hind femora comparatively sharply swollen towards the base (Fig. 38). Ovipositor length 10·7–13·2 mm. Subgenital plate with a truncate apex (Fig. 44) *C. saltator* (Saussure) (p. 347)

Positive identification of *C. oceanicus, C. starmuehlneri, C. redtenbacheri* and *C. infumatus* may prove to be very difficult in some cases owing to the variability of some of these species, and the subtlety of the distinctions between them. Specimens of these species can be identified in many cases by their geographical data (see under the descriptions of these species).



Figs 33–44 33–36, the left female forewing of (33) *Conocephalus starmuehlneri*; (34) *C. redtenbacheri* (brachypterous); (35) *C. oceanicus*; (36) *C. saltator* (macropterous). 37, 38, the left hind femur of (37) *C. oceanicus*; (38) *C. saltator*. 39, dorsal view of the left stridulatory area of *C. laetus*, indicating the points between which measurements were made. 40, ventral view of the apex of the left hind tibiae of *C. saltator*. 41, 42, posterodorsal view of the male tenth tergite of (41) *C. upoluensis*; (42) *C. albescens*. 43, 44, ventral view of the female subgenital plate of (43) *C. starmuehlneri*; (44) *C. saltator*.

Descriptions of the Pacific species

Conocephalus oceanicus (Le Guillou)
(Figs 1, 2, 35, 37, 45)

Xiphidion oceanicum Le Guillou, 1841:294. LECTOTYPE ♂, SAMOA (MNHN, Paris), here designated [examined].

Xiphidium affine Redtenbacher, 1891:513. LECTOTYPE ♂, FIJI IS. (NM, Vienna), here designated [examined]. **Syn. n.**

DIAGNOSIS. ♂ ♀. Fastigium of vertex moderately narrow. Prosternum bispinose. Macropterous. Forewings unicolorous. Cross-veins of costal and precostal areas of forewings mostly regular, parallel. *MA* of forewings shaped as in Fig. 35. Stridulatory file of left male forewing shaped as in Fig. 45, with few surrounding spinules (11 specimens examined). Hind femora not sharply swollen towards base (Fig. 37), with 1–7 externoventral spines. Hind tibiae with 6 apical spurs. Male cerci as in Figs 2, 2a, with one well-developed internal spine with gently curved apex, and one tubercle. Female subgenital plate with shallow excision at apex. Ovipositor of medium length, relatively straight.

MEASUREMENTS

	Males	Females
Fastigium width	(23): 0·40– 0·53 (0·47)	(24): 0·42– 0·58 (0·50)
Median length of pronotum	(26): 2·4 – 3·2 (2·94)	(29): 2·5 – 3·6 (3·16)
Forewing length	(23): 11·5 –18·6 (15·68)	(27): 13·4 –20·7 (16·80)
Hind femur length	(20): 10·3 –13·9 (12·52)	(21): 11·1 –15·4 (13·54)
Cercus length	(22): 1·47– 1·81 (1·65)	
Ovipositor length		(28): 8·3 –11·1 (9·63)
Pronotum length/fastigium width	(22): 5·71– 7·62 (6·29)	(20): 5·52 – 7·27 (6·30)
Hind femur length/ovipositor length		(21): 1·29 – 1·52 (1·41)

DISCUSSION. *C. oceanicus* forms a very close group with *C. starmuehlneri, C. redtenbacheri* and *C. infumatus,* differing from the first in wing length, and the others in having unicolorous forewings; it also differs from *C. redtenbacheri* in the shape of the internal spine of the male cerci.

The similarity of *C. oceanicus* and *C. redtenbacheri* has led to them being confused in the literature. Redtenbacher's description of *Xiphidium affine* refers to specimens with unicolorous forewings or with the radial vein darker, which suggests that his syntype-series contained both species. I have examined 5 ♂, 2 ♀ from this series, all of which are *C. oceanicus,* and I have selected a lectotype from these specimens, thus fixing the identity of *X. affine* as a synonym of *C. oceanicus.* The other syntypes, which I have not seen, have the following data: Fiji: Ovalau. Samoa. Aru Is. (*Brunner*).

I have selected a lectotype of *Xiphidion oceanicum* from the type-series of 1 ♂, 3 ♀, all of which I have examined. Redtenbacher (1891:512) referred to *Xiphidion oceanicum* as a possible synonym of *Xiphidium longipenne* de Haan. I have examined the types of both species and found them to be distinct and very different species.

Further knowledge of *C. oceanicus, C. starmuehlneri, C. redtenbacheri* and *C. infumatus* may show them to be no more than forms of a single species. I am regarding them as separate species here as they have already been given specific status by previous workers, and there are distinct, although slight, differences between them. They cannot be considered as four subspecies of one species as the distribution of each overlaps with one or more of the others (see Fig. 1, Table 1, and the discussion on p. 321).

MATERIAL EXAMINED (175 Pacific specimens)

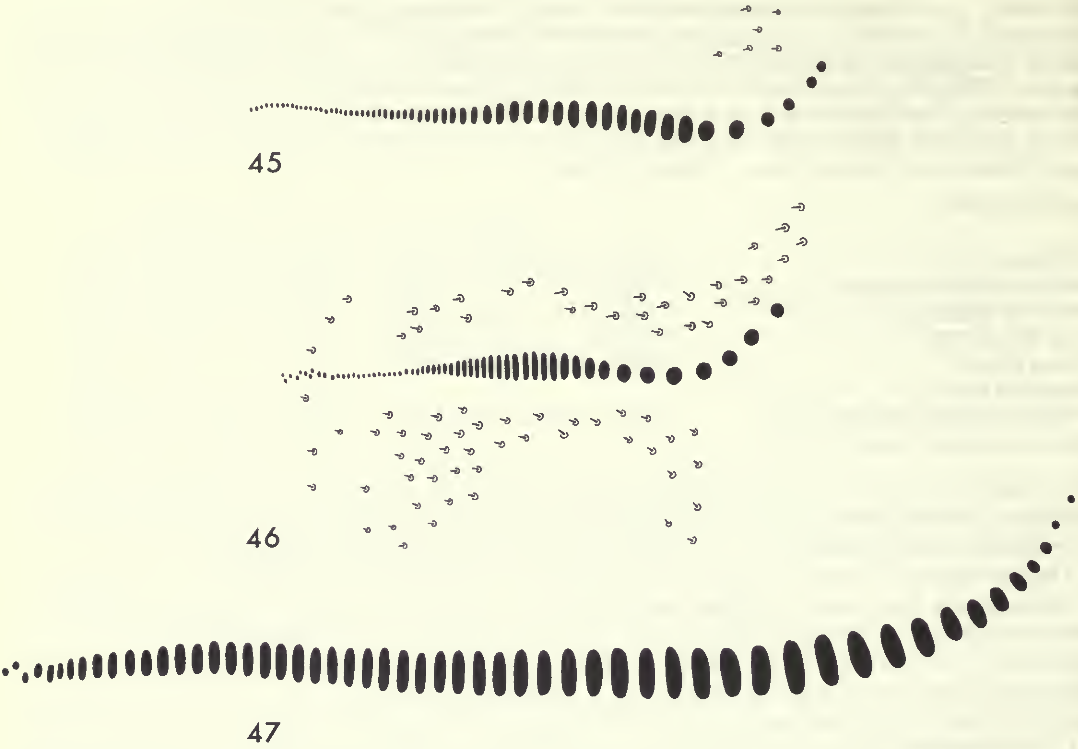
Xiphidion oceanicum Le Guillou, lectotype ♂, **Samoa** (*Jacquinot*) (MNHN, Paris). *Xiphidium affine* Redtenbacher, lectotype ♂, **Fiji Is.** ('Coll. Br. v. W. ex Mus. Godeffroy') (NM, Vienna).

Cook Is.: 1 ♂, Aitutaki, v; 1 ♀, Raratonga, vii. **Ellice Is.**: 3 ♂, 2 ♀, Funafuti I., Funafuti, 0–5 m, ii. **Fiji Is.**: 1 ♂ (*Thorey*) (NM, Vienna) (paralectotype of *Xiphidium affine* Redtenbacher); 2 ♀ (NM, Vienna) (paralectotypes of *Xiphidium affine* Redtenbacher); Avea; Fulanga; Komo; Lakemba; Matuku; Moala; Oneata; Ovalau; Taveuni; Vanua Levu; Viti Levu. **Marquesas Is.**: Nuku Hiva. **New Caledonia. New Hebrides**: Aneityum; Banks Is.; Efate; Erromango; Espiritu Santo; Malekula; Oba; Vanua Lava. **New Guinea**: Papua New Guinea. **Samoa**: 2 ♀ (*Jacquinot*) (MNHN, Paris) (paralectotypes of *Xiphidion oceanicum* Le Guillou); American, Swains; A., Tutuila; Western, Alafua; W., Savaii; W., Upolu. **Society Is.**:

Bora Bora; Huahine; N Raiatea; Tahiti. **Tonga Is.**: 1 ♂, Niuatoputapu, v; 2 ♂, Tongatapu, vii; 1 ♂, 1 ♀, T., Nukualofa, ii-x. **Tubuai Is.** (Austral Is.): 1 ♂, Rurutu, iii. (BMNH; DSIR, Auckland; ANIC, Canberra; BPBM, Honolulu.)

Extralimital material. **Aru Is.**: 1 ♀ (MNHN, Paris) (paralectotype of *Xiphidion oceanicum* Le Guillou). **Philippines**: 3 ♂ (MHN, Geneva) (paralectotypes of *Xiphidium affine* Redtenbacher); Babuyan Is.; Luzon. **Vietnam**.

DISTRIBUTION (Fig. 1 and Table 1). This species is comparatively widely distributed in the Pacific.



Figs 45–47 Diagrams showing the arrangement of teeth in the stridulatory file on the under surface of the left male forewing, and the associated spinules of (45) *Conocephalus oceanicus*; (46) *C. redtenbacheri*; (47) *C. willemsei*. Other species, similar to these in the arrangement of the stridulatory teeth, may differ in the size of the file and in the presence or absence of surrounding spinules.

Conocephalus starmuehlneri Kaltenbach

(Figs 1, 3, 33, 43)

Conocephalus (Xiphidion) starmühlneri Kaltenbach, 1968: 548. Holotype ♂, NEW CALEDONIA (NM, Vienna) [examined].

DIAGNOSIS. ♂ ♀. Fastigium of vertex narrow. Prosternum bisipinose. Brachypterous. Forewings unicolorous, or at most veins *R* and *Sc* only slightly darkened (very rarely towards base). Forewings comparatively wide, tapering abruptly towards apex (Fig. 33). Cross-veins of costal and precostal areas of forewings regular, parallel. Stridulatory file of left male forewing shaped as in Fig. 45, with few surrounding spinules (5 specimens examined). Hind femora with 4–8 externoventral spines. Hind tibiae with 6 apical spurs. Male cerci as in Fig. 3, with one well-developed internal spine with gently curved apex, similar to Fig. 2a, and one tubercle. Female subgenital plate with shallow excision at apex (Fig. 43). Ovipositor of medium length, relatively straight.

MEASUREMEMENTS

	Males	Females
Fastigium width	(8): 0·39– 0·42 (0·41)	(11): 0·42– 0·52 (0·46)
Median length of pronotum	(10): 2·9 – 3·2 (3·04)	(13): 3·1 – 3·7 (3·29)
Forewing length	(9): 7·8 –10·7 (9·11)	(12): 6·9 – 8·3 (7·44)
Hind femur length	(6): 11·2 –13·0 (11·92)	(13): 12·1 –14·6 (12·90)
Cercus length	(8): 1·81– 1·91 (1·84)	
Ovipositor length		(13): 10·1 –12·2 (10·90)
Pronotum length/fastigium width	(8): 6·8 – 8·1 (7·53)	(11): 6·8 – 7·9 (7·29)
Hind femur length/ovipositor length		(13): 1·11– 1·26 (1·19)

DISCUSSION. *C. starmuehlneri* closely resembles *C. oceanicus, C. redtenbacheri* and *C. infumatus*. It is distinguished from all except *C. redtenbacheri* by being brachypterous, and differs from brachypterous *C. redtenbacheri* in the shape of the male internal cercal spine, in the forewing shape, and in most cases in the fainter forewing pigmentation. *C. starmuehlneri* differs from *C. oceanicus* and *C. infumatus* in the ratio of the hind femur to ovipositor length, and in addition differs from *C. infumatus* in having fainter forewing pigmentation. If it were not for these differences *C. starmuehlneri* might be regarded as a brachypterous form of one of these species. I have seen a macropterous female specimen from New Caledonia: Bourail, which possibly belongs to this species. This specimen differs from both *C. oceanicus* and *C. infumatus* in having a ratio of hind femur to ovipositor length of 1·24, and has almost unicolorous forewings.

I have found a character used by Kaltenbach (1968) to separate *C. starmuehlneri* and *C. oceanicus* to be unreliable in the material I have examined; this is a longitudinal brown stripe on each side of the pronotum. These stripes are present in the type-specimens I have seen, although they are very faint in the holotype. They are not present, however, in the other material I have examined, which is otherwise identical with the type-material. Stripes on the sides of the pronotum, although not found in *C. oceanicus,* are present (usually faintly) in some specimens of another closely related species, *C. redtenbacheri.*

MATERIAL EXAMINED

Holotype ♂, **New Caledonia**: R. Negropo, near Canala, bank ['Uferregion'], 29.vii.1965 (*Österreichische Neukaledonien-Expedition*) (NM, Vienna).

New Caledonia: 7 ♂, 9 ♀ (BMNH); 1 ♂, col. d'Amieu, 650 m, (BPBM, Honolulu); 2 ♀, La Crouen, iii (BPBM, Honolulu); 1 ♂, upper course of R. Negropo, near Koh, 29.vii.1965 (*Österr. Neukaled.-Exped.*) (NM, Vienna) (paratype); 2 ♀, R. Negropo, near Canala, bank, 29.vii.1965 (*Österr. Neukaled.-Exped.*) (NM, Vienna) (paratypes).

DISTRIBUTION (Fig. 1 and Table 1). Known only from New Caledonia.

Conocephalus redtenbacheri (Bolívar)
(Figs 1, 4, 34, 46, 48, 49)

Xiphidium redtenbacheri Bolívar, 1905: 389. Syntypes ♂, ♀, NEW GUINEA: Papua New Guinea, Sattelberg, 1898 (*Biró*) (lost). NEOTYPE ♂, NEW GUINEA (BMNH), here designated [examined].

DIAGNOSIS. ♂ ♀. Fastigium of vertex narrow. Prosternum bispinose. Brachypterous to macropterous. Forewings with veins *R* and *Sc* darkened, at least towards base, sometimes only faintly. Forewings (of brachypterous form) shaped as in Fig. 34. Cross-veins of costal and precostal areas of forewings regular, parallel. Stridulatory file of left male forewing shaped as in Fig. 46, surrounded by many spinules (14 specimens examined). Hind femora with 1–7 externoventral spines; very rarely unarmed. Hind tibiae with 6 apical spurs. Male cerci as in Figs 4, 4a, with one well-developed spine with hook-shaped apex, and one tubercle. Female subgenital plate with shallow excision at apex. Ovipositor moderately short, relatively straight. Song as in oscillograms, Figs 48, 49, consisting of chirps lasting 1–3 seconds, repeated at a variable rate (usually *c.* 9 per minute), with a regular rate of *c.* 120 syllables per second. The songs of brachypterous and macropterous specimens were similar.

MEASUREMENTS

	Males	Females
Fastigium width	(35): 0·26– 0·50 (0·36)	(27): 0·31– 0·55 (0·43)
Median length of pronotum	(31): 2·2 – 3·1 (2·74)	(33): 2·4 – 3.5 (2·99)
Forewing length	(42): 6·6 –17·6 (12·81)	(42): 5·5 –20·6 (13·09)
Hind femur length	(30): 9·9 –14·3 (12·10)	(23): 10·6 –16·2 (13·65)
Cercus length	(36): 1·29– 1·66 (1·48)	
Ovipositor length		(31): 6·8 –10·7 (8·97)
Pronotum length/fastigium width	(31): 5·8 – 9·3 (7·71)	(26): 5·5 – 8·8 (7·09)
Hind femur length/ovipositor length		(22): 1·37– 1·70 (1·51)

DISCUSSION. *C. redtenbacheri* closely resembles *C. oceanicus, C. starmuehlneri* and *C. infumatus*. It differs from all these species in the shape of the internal spine of the male cerci, and from the first two, in most cases, in the forewing pigmentation. Many spinules surround the stridulatory file of *C. redtenbacheri* whereas these are fewer and more restricted in the other three species (except occasionally in *C. infumatus*).

To judge from the material examined *C. redtenbacheri* is the commonest species of the genus in the Pacific. The large number of specimens examined showed considerable variation, particularly in forewing length, which ranged continuously from brachypterous to macropterous, although the intermediates were in the minority. Specimens from the Solomon Is. were always macropterous. Those from Solomon Is.: Ontong Java were usually particularly small, resembling the small New Ireland form of *C. infumatus*. The width of the fastigium of the vertex was also variable, particularly in New Guinea specimens, while some small populations elsewhere in the range were comparatively uniform.

The forewings were rarely as strongly pigmented around the veins *R* and *Sc* as those of *C. infumatus,* and were occasionally extremely faintly pigmented. It is therefore possible that some females of this species might not be distinguishable with certainty from females of *C. oceanicus* on morphology alone. Approximately 1% of the specimens examined lacked spines on one hind femur, and 1 ♂, 1 ♀ had no spines on either hind femur. I examined one specimen, which I believe to be an aberration of this species, with very tiny cerci; these differed in shape from those of the other adult males, although they were similar to those of nymphs of the species.

The syntypes of *Xiphidium redtenbacheri,* from New Guinea, were lost when the Orthopteroid collection of the Természettudományi Múzeum, Budapest, was burnt in 1956 (pers. comm. from Dr H. Steinmann). I have selected a male neotype, also from New Guinea, for which I have a song recording.

MATERIAL EXAMINED (1077 Pacific specimens)

Xiphidium redtenbacheri Bolívar, neotype ♂, **New Guinea**: Papua New Guinea, Morobe Province, Wau, *c.* 1200 m, Ecology Institute grounds, 3.vii.1979 (*Robinson*) (BMNH), associated with tape recording no. 301 (recorded by W. J. Reynolds and L. M. Pitkin; tape in BMNH Library of Recorded Insect Sounds).

Admiralty Is.: 1 ♂, Manus, 6 km SE. of Lorengau, Rossum, 180 m, xii. **Australia**: 1 ♀, Queensland, vi-vii; 1 ♀, Q., Aratula, xii; 2 ♂, Q., Cairns, iii-xi; 4 ♂, 1 ♀, Q., Cairns, Freshwater Creek, ii; 1 ♀, Q., Kuranda, 200 m, iii. **New Britain**: 1 ♂, Gazelle Pen., Keravat, 60 m, ix; 1 ♂, G. P., Keravat, ii; 1 ♂, G. P., Warongoi Val., 100 m, v; 2 ♂, 5 ♀, Nakanai Mts, Silanga, 150 m, vii-viii; 1 ♂, Vudal, vi. **New Guinea**: Irian Jaya; Papua New Guinea (and associated tape recordings). **New Hanover**: 1 ♂, v. **Solomon Is.**: 1 ♂, 1 ♀; 4 ♂, 6 ♀, Bellona, x-xi; 2 ♀, B., Henuangoto, v-x; 1 ♀, Biawa, iv; 2 ♂, 1 ♀, Bougainville, v-vii; 1 ♀, B., Buin, vi; 1 ♂, B., Buin (Kangu), 1–50 m, v; 2 ♀, B., Buin area, Konga Village, ii-iii; 1 ♂, 3 ♀, B., Buin area, Kugukai Village, 150 m, xi-i; 1 ♂, 1 ♀, B., Arigua, vi; 2 ♂, 1 ♀, B., Kieta, xi; 3 ♂, B., Kokure, 690 m, vi; 1 ♂, 3 ♀, B., Kokure, near Crown Prince Ra., 900 m, vi; 2 ♀, B., Mumurai, vi; 2 ♀, B., Mumurai, 400 m, vi; 1 ♀, B., Numa Numa, vi; 1 ♂, B., Sovele Mission, 250 m, vi; 2 ♂, 2 ♀, B., Teopasino, c. 5° 40′ S, 155° 07′ E, vi; 1 ♀, B., Tokinoitu, 20 m, vi; 1 ♂, Buka, Gagan, 40 m, vi; 1 ♀, Choiseul, Malangono, viii; 1 ♂, 2 ♀, C., Malangono, 10 m, iii; 3 ♂, 3 ♀, Guadalcanal, ii–xii; 3 ♂, 1 ♀, G., 900–1500 m, xii; 2 ♂, 1 ♀, G., Betikama R., viii–ix; 2 ♂, 2 ♀, G., Bonegi R., 210 m, xii; 1 ♀, G., Gold Ridge, iv; 2 ♂, 1 ♀, G., Gold Ridge, 500 m, vi; 1 ♀, G., Gold Ridge, 800 m, vi; 1 ♂, 1 ♀, G., Honiara, v–x; 2 ♂, 3 ♀, G., Honiara District, Tenaru, vii–x; 1 ♀, G., Tenaru, 0–100 m, i; 1 ♂, G., Tenaru R. (mouth), viii; 1 ♀, G., 30 km W. of Honiara, Tambalia, v; 1 ♂, G., 35 km W. of Honiara, Tambalia, 30 m, v; 1 ♂, 1 ♀, G., H. D., Poha R., vii; 2 ♂, G., Ilu Farm, near Nalimbu R., 5 m, vii; 3 ♂, 2 ♀, G., Ilu, ii–vi; 1 ♀, G., Kiwi Creek, viii; 3 ♂, 3 ♀, G., Kukum, i–vii; 2 ♂, 1 ♀, G., Lunga R. (mouth), v–vi; 1 ♂, 1 ♀, G., Metanikan R. (mouth), v; 12 ♂, 6 ♀, G., Nuhu, x; 1 ♀, G., Rua

Vatu, xi; 2 ♂, G., Suta, vi; 3 ♂, 3 ♀, G., Suta, 500–1200 m, vi; 1 ♀, G., Sutakiki R., vi; 1 ♀, G., Sutakiki R., 610 m, iv; 1 ♂, G., Tadhimboko, 0–100 m, x; 1 ♂, 1 ♀, G., Tapenanje, xii; 1 ♂, 3 ♀, G., near Terere, Roroni, 1 ♀, G., Tinahula R., iii; 1 ♀, G., Umasani R., 10 km inland, i–vii; 1 ♀, G., Wright's Creek, viii; 1 ♂, 2 ♀, Malaita, Auki, 2–20 m, ix–xii; 1 ♀, M., Kwailasi, Fulisango, v; 1 ♂, 1 ♀, M., Rai'ako, v; 1 ♂, 2 ♀, M., Sikiana, iii–x; 1 ♀, M., Su'u, iv; 1 ♀, Ndai, Bethlehem, 0–10 m, xii; 2 ♀, New Georgia Group, Gizo I., 30 m, vii; 1 ♂, N. G. G., G., 50–120 m, iv; 1 ♂, 1 ♀, N. G. G., G., Gizo 0–100 m, xi; 1 ♀, N. G. G., G., Loga I., x; 1 ♂, 1 ♀, N. G. G., Kolombangara, viii; 4 ♂, 2 ♀, N. G. G., K., Kuzi, x; 1 ♂, 1 ♀, N. G. G., K., Pepele, 30 m, ii; 2 ♀, N. G. G., New Georgia I., Munda, 1–30 m, vii; 2 ♀, N. G. G., N. G., Munda and district, viii; 1 ♂, 3 ♀, N. G. G., N. G., Segi, Maravo, v; 1 ♂, 2 ♀, Ontong Java, Kepae, i; 11 ♂, 9 ♀, O. J., Kiloma, i; 2 ♂, O. J., Leuaniua, i; 5 ♂, 10 ♀, O. J., Peku, 0–10 m, xii; 6 ♂, 8 ♀, O. J., Pelau, ii; 3 ♂, 3 ♀, Rennell, Hutuna, x–xi; 2 ♀, Russell Is., Yandina, ix; 1 ♂, San Cristobal, Hawa, v; 3 ♂, S. C., Huni R. (mouth), viii; 1 ♂, S. C., Makina, v; 1 ♂, S. C., Waimamura, iv; 1 ♂, S. C., Wainoni, vii; 3 ♀, Santa Cruz Is., Utupua, xi; 6 ♂, 1 ♀, S. C., Vanikoro Is., ii–xi; 1 ♀, S. C., V., Buma, ix; 1 ♂, Santa Isabel, iii; 1 ♀, S. I., Allardyce Hbr, ii; 1 ♀, S. I., Gatere, ii; 1 ♀, S. I., Maringe Lagoon ('Lgu'?), ii; 1 ♀, S. I., Rasa, v; 1 ♀, S. I., Sisaga, ii; 2 ♀, S. I., Tatamba, ix; 1 ♂, Vella Lavella, Kow, 30 m, xi; 4 ♂, 6 ♀, V. L., Ulo Crater, 10 m, xii. (BMNH; ANIC, Canberra; BPBM, Honolulu; DPI, Konedobu.)

Extralimital material. **Philippines**: Mindanao; Palawan.

DISTRIBUTION (Fig. 1 and Table 1). This species is very common and widespread in the western Pacific.

Conocephalus infumatus (Redtenbacher)

(Figs 1, 5, 6)

Xiphidium infumatum Redtenbacher, 1891: 512. Holotype ♀, DUKE OF YORK GROUP: Mioko (between New Britain and New Ireland) (lost). NEOTYPE ♂, NEW BRITAIN (BPBM, Honolulu), here designated [examined].

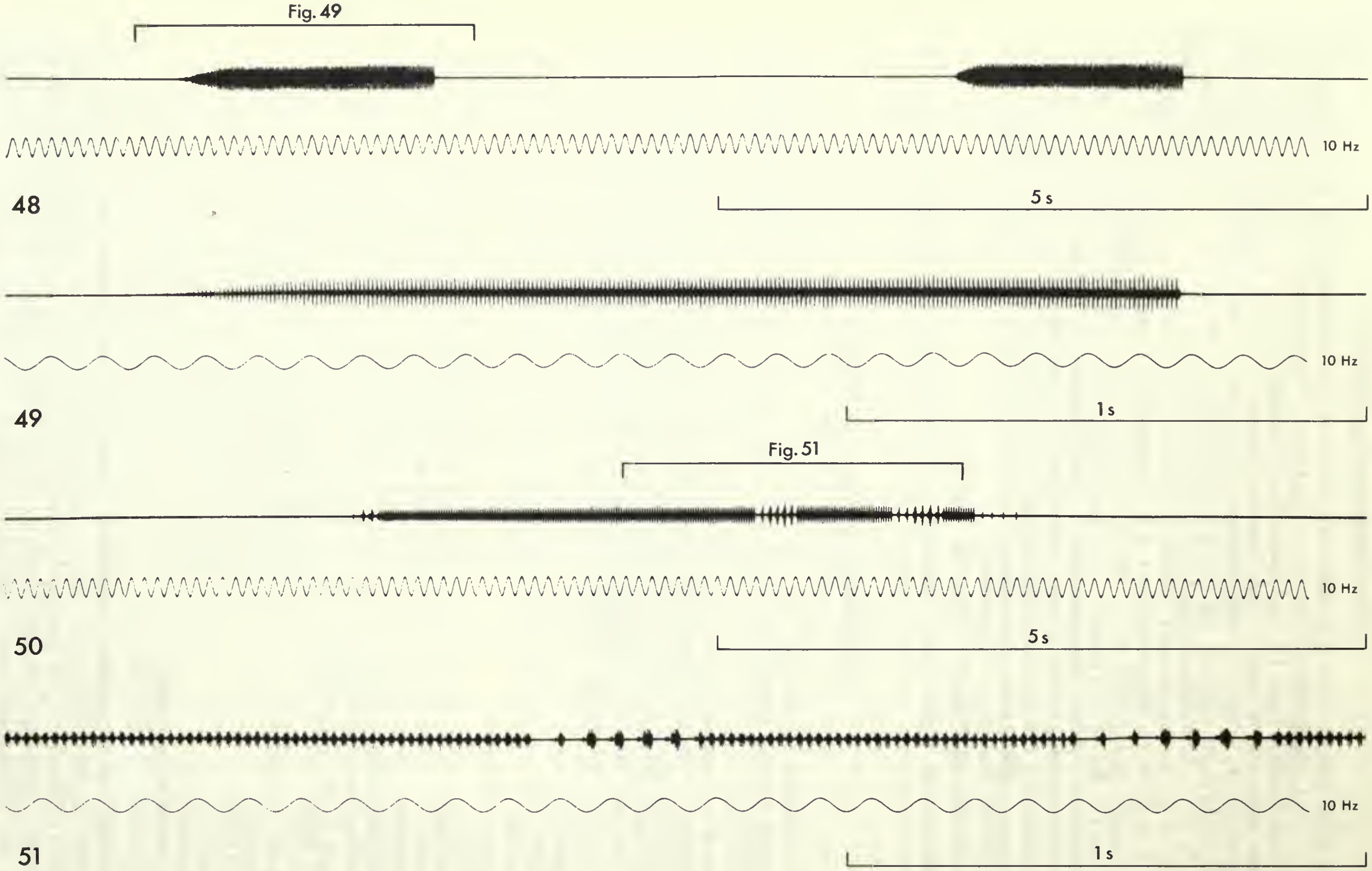
DIAGNOSIS. ♂ ♀. Fastigium of vertex narrow. Prosternum bispinose. Macropterous. Forewings with veins *R* and *Sc* darkened. Cross-veins of costal and precostal areas of forewings regular, parallel. Stridulatory file of left male forewing shaped as in Fig. 45, mostly with few surrounding spinules. Hind femora with 2–9 externoventral spines. Hind tibiae with 6 apical spurs. Male cerci as in Figs 5, 5a, 6, 6a, with one well-developed internal spine with moderately gradually curved apex, and one tubercle. Female subgenital plate with moderately shallow excised apex. Ovipositor moderately short to medium length, relatively straight.

MEASUREMENTS

Typical form	Males	Females
Fastigium width	(10): 0·31– 0·39 (0·35)	(33): 0·26– 0·42 (0·34)
Median length of pronotum	(10): 3·1 – 3·5 (3·24)	(33): 3·2 – 4·0 (3·56)
Forewing length	(10): 13·4 –18·5 (16·37)	(33): 15·9 –22·1 (18·60)
Hind femur length	(9): 13·4 –15·8 (14·18)	(28): 14·1 –17·0 (15·56)
Cercus length	(10): 1·68– 1·84 (1·77)	
Ovipositor length		(31): 9·7 –11·5 (10·56)
Pronotum length/fastigium width	(10): 8·8 –10·3 (9·38)	(33): 9·0 –12·5 (10·63)
Hind femur length/ovipositor length		(26): 1·35– 1·57 (1·48)

Small New Ireland form (see below)	Males	Females
Fastigium width	(6): 0·23– 0·29 (0·27)	(3): 0·28– 0·29 (0·29)
Median length of pronotum	(6): 2·2 – 3·0 (2·44)	(3): 2·6 – 2·8 (2·70)
Forewing length	(6): 9·3 –13·3 (10·53)	(3): 11·7 –13·1 (12·35)
Hind femur length	(4): 9·9 –12·5 (10·89)	(3): 11·6 –12·3 (11·81)
Cercus length	(5): 1·29– 1·64 (1·44)	
Ovipositor length		(3): 8·2 – 9·1 (8·57)
Pronotum length/fastigium width	(6): 8·0 –10·5 (9·22)	(3): 9·3 – 9·6 (9·41)
Hing femur length/ovipositor length		(3): 1·36– 1·41 (1·38)

DISCUSSION. *C. infumatus* closely resembles *C. oceanicus, C. starmuehlneri* and *C. redtenbacheri,* in particular the last of these. It can be distinguished from these species by the following combination of characters: the strongly darkened *R* and *Sc* in the forewings (except for small New Ireland form – see below); the fairly gently curved apex of the internal spine of the male cerci, and the high ratio of pronotum length to width of fastigium. The internal spine of the male cerci is



Figs 48–51 Oscillograms of typical parts of the songs brachypterous specimens of (48, 49) *Conocephalus redtenbacheri;* (50, 51) *C. semivittatus* (typical form); both from New Guinea. The songs were recorded at temperatures of 30°C and 28°C respectively, using a tape speed of 38 cm/s (equipment specified on p. 320).

intermediate in shape between *C. oceanicus* and *C. redtenbacheri,* although slightly closer to the former.

Most of the specimens examined from New Ireland seemed to belong to a small form, distinguishable from the typical form by the following key.

1 Comparatively large specimens with dark pigmentation around *R* and *Sc* of the forewings. Hind femur length at least 13·0 mm. Forewing length at least: ♂, 13·4 mm; ♀, 15·9 mm . . . . **typical form**

– Comparatively small specimens with fairly weak pigmentation around *R* and *Sc* of the forewings. Hind femur length at most 12·5 mm. Forewing length at most: ♂, 13·3 mm; ♀, 13·1 mm . . . . **small New Ireland form**

The existence of two forms of of this species is a further complication in considering its status in relation to its three close relatives. Where *C. infumatus* comes in contact with *C. redtenbacheri* in New Britain, the two species are distinct. At the eastern end of the range, however, the speciation appears to be less complete. The small New Ireland form of *C. infumatus* is very similar to some specimens of *C. redtenbacheri* in the Solomon Is., in particular Ontong Java. Most specimens of the small New Ireland form have been found off New Ireland in the Faed Is. of the Nuguria Is., which, like the Ontong Java Is. in the Solomon Is., are a very small, outlying easterly group.

The female holotype of *Xiphidium infumatum* is lost (see Weidner, 1966:243). I have selected a male neotype, as the males of this species are more easily distinguished from related species than the females. The neotype-locality is in New Britain, not far from the original type-locality, the island of Mioko.

One specimen of *C. infumatus* was found to have an internoventral spine on one hind femur.

MATERIAL EXAMINED

Xiphidium infumatum Redtenbacher, neotype ♂, **New Britain**: Gazelle Peninsula, Baining, St Paul's, 350 m, 5.ix.1955 (*Gressitt*) (BPBM, Honolulu).

Typical form. **New Britain**: 7 ♂, 9 ♀, Gazelle Peninsula, Baining, St Paul's, 350 m, ix; 1 ♀, G. P., Keravat, ii; 1 ♀, G. P., Upper Warongoi, Illugi, 230 m, xii; 1 ♀, G. P., Warongoi Valley, 100 m, v; 3 ♀, Mosa Plantation, iv–vi; 2 ♀, Mosa Village, iv; 2 ♀, Nakanai Mts, Gisiluve, 1050 m, vii; 1 ♂, 3 ♀, N. M., Silanga, 150 m, vii–viii; 2 ♀, N. M., Talalo, 900 m, vii; 1 ♂, N. M., Ti, vii; 1 ♀, S. coast, Rano Pl'n, iv; 1 ♀, Mt Sinewit, 1070 m, viii; 1 ♀, N. coast, Walo, vii; 2 ♀, W. of Willaumez Peninsula, Linga Linga Pl'n, 1 m, iv. **New Ireland**: 1 ♀, Kandan, xii. **Solomon Is.**: 1 ♀, Bougainville, Kokure, near Crown Prince Range, 900 m, vi. (BMNH; ANIC, Canberra; BPBM, Honolulu; DPI, Konedobu.)

Small New Ireland form. **New Ireland**: 5 ♂, 3 ♀, Faed Is., x (BMNH; DPI, Konedobu); 1 ♂, Gilingil Pl'n, 2 m, vii (BPBM, Honolulu).

DISTRIBUTION (Fig. 1 and Table 1). This species only occurs in New Britain, New Ireland and the northernmost of the Solomon Is. Previous records of the species from New Guinea refer to specimens which I have not seen but consider likely to be *C. redtenbacheri.*

Conocephalus semivittatus (Walker)

(Figs 7–9, 28, 50–53)

Decticus semivittatus Walker, 1869:263.

DIAGNOSIS. ♂ ♀. Fastigium of vertex wide. Prosternum bispinose. Macropterous or brachypterous. Forewings with dark pigmentation in costal and precostal areas, and usually with spot at posterior margin (Fig. 28). Cross-veins of costal and precostal areas of forewings irregular or reduced. Stridulatory file of left male forewing shaped as in Figs 45 and 46. Hind femora with 1–9 externoventral spines. Hind tibiae with 6 apical spurs. Male cerci shaped as in Figs 7–9, with one well-developed internal spine and one tubercle. Female subgenital plate with excised or truncate apex. Ovipositor of short to medium length, relatively straight.

DISCUSSION. *C. semivittatus* resembles *C. tumidus* but differs from it in the shape of the male cerci and usually in the number of hind tibial spurs. Nearly all the females examined had a narrower fastigium of the vertex than those of *C. tumidus*. The excised apex of the female subgenital plate of the nominate subspecies and the typical form of subspecies *vittatus* also distinguishes them from those of *C. tumidus.*

Specimens occurring in the north of the species range differ in some characters from those in the south, and I consider them to belong to a distinct subspecies. The geographical ranges of the two subspecies do not overlap, although they approach each other in Australia, where *C. s. semivittatus* occurs in the south and *C. s. vittatus* is apparently confined to the north. I have only seen two specimens of the latter subspecies from Australia, both males, but these have particularly stout cerci, suggesting that this character may be more pronounced in the region of contact between the two subspecies. If this is taken as evidence of character displacement, it suggests that the two groups, which have long been regarded as a single species, might be specifically distinct. More specimens are required before a firm judgement can be made on this possibility.

The right forewing of the brachypterous males was usually slightly longer (by 0·3 mm on average) than the left forewing.

DISTRIBUTION (Table 1). This species is common and widespread in the western Pacific.

Key to the subspecies and forms of *C. semivittatus*

1 Left forewing, and sometimes right, with spot at posterior margin as in Fig. 28. Male cerci shaped as in Figs 7, 8. Female subgenital plate with excised apex 2

– Forewings without spot at posterior margin, or at most with diffuse trace. Male cerci shaped as in Fig. 9. Female subgenital plate with truncate apex . . . . *C. s. vittatus* (Redtenbacher) (small form) (p. 338)

2 Dorsum of pronotum patterned as in Fig. 52. Male cerci, from internal spine to apex, comparatively long and slender in proportion to size (Fig. 7). Ovipositor length at least 10·5 mm . . . . *C. s. semivittatus* (Walker) (p. 336)

– Dorsum of pronotum patterned as in Fig. 53. Male cerci, from internal spine to apex, comparatively short and robust, narrowing sharply at apex (Fig. 8). Ovipositor length not more than 9·5 mm . . . . *C. s. vittatus* (Redtenbacher) (typical form) (p. 338)

Conocephalus semivittatus semivittatus (Walker)
(Figs 7, 52)

Decticus semivittatus Walker, 1869: 263. Holotype ♀, NEW ZEALAND (BMNH) [examined].

Xiphidium maoricum Walker, 1869: 276. LECTOTYPE ♀, NEW ZEALAND (BMNH), here designated [examined]. [Synonymized by Hutton, 1898: 137.]

Xiphidium antipodum Scudder, 1875: 460. LECTOTYPE ♂, NEW ZEALAND (ANS, Philadelphia), here designated [examined]. [Synonymized by Hutton, 1898: 137.]

Xiphidium (Xiphidion) brunneri Karny, 1907: 94. LECTOTYPE ♀, NEW ZEALAND (NM, Vienna), here designated [examined]. **Syn. n.**

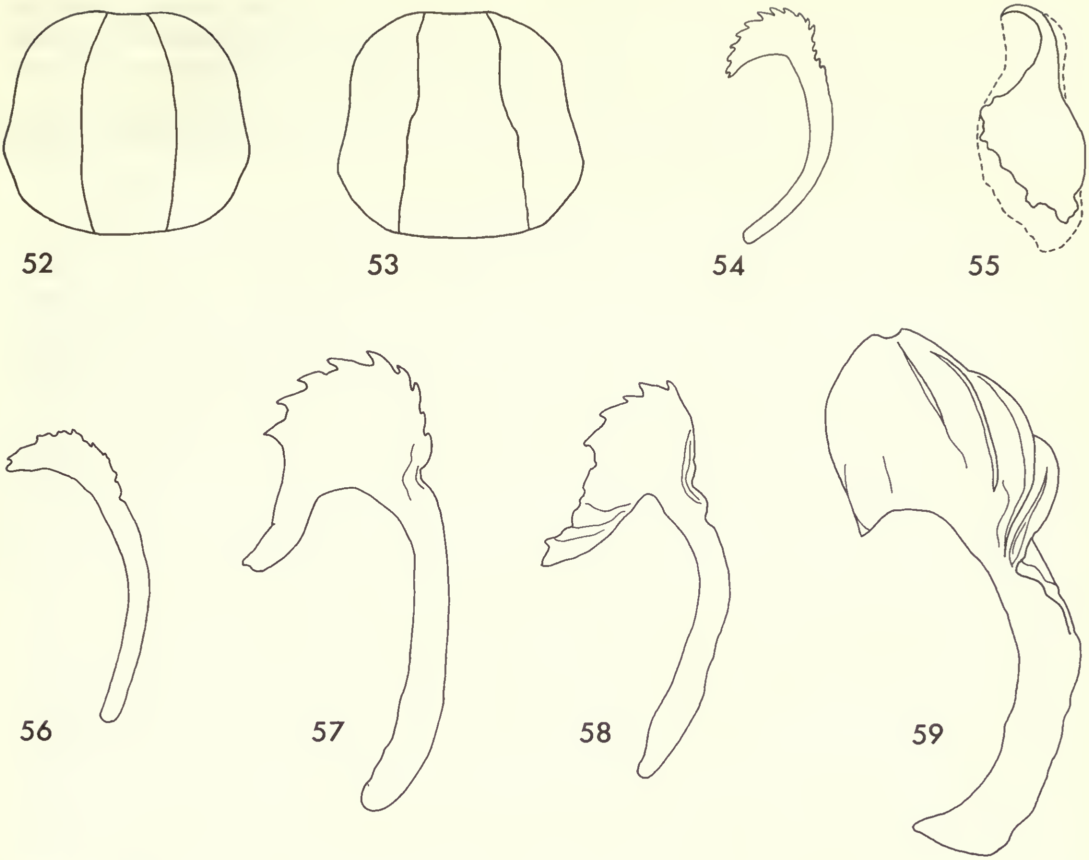
DIAGNOSIS. ♂ ♀. Dark stripe of dorsum of pronotum shaped as in Fig. 52. Left forewing, and sometimes right, with spot on posterior margin as in Fig. 28. Male cerci from internal spine to apex, comparatively long and uniformly slender, in proportion to size (Fig. 7). Female subgenital plate with excised apex. Ovipositor of medium length.

MEASUREMENTS

	Males	Females
Fastigium width	(20): 0·55– 0·80 (0·65)	(40): 0·57– 0·81 (0·71)
Median length of pronotum	(20): 3·0 – 3·9 (3·38)	(42): 3·2 – 4·1 (3·68)
Forewing length (macropterous)	(5): 20·1 –21·2 (20·73)	(21): 20·7 –23·8 (21·91)
(brachypterous)	(15): 4·6 – 7·8 (5·94)	(19): 2·5 – 5·9 (3·70)
Hind femur length	(14): 11·6 –14·2 (13·15)	(33): 12·3 –16·5 (14·70)
Ovipositor length		(41): 9·9 –12·7 (11·49)

DISCUSSION. The nominate subspecies differs from *C. s. vittatus* in the shape of the male cerci and the longer ovipositor. It also differs, at least from the typical form of *C. s. vittatus*, in the shape of the dorsal pronotal stripe.

The lectotype of *Xiphidium maoricum* was selected from the type-series of 2 ♀, both of which I have examined. A lectotype was also selected from the 1 ♂, 1 ♀ adult syntypes of *Xiphidium antipodum*, which I have examined; there are several nymphal syntypes which I have not seen.



Figs 52–59 52, 53, dorsal view of the pronotum showing the outline of the area of dark pigmentation of (52) *Conocephalus semivittatus semivittatus*; (53) *C. semivittatus vittatus* (typical form). 54–59, dorsal view of the right titillator of (54) *C. tumidus*; (55) *C. angustivertex*; (56) *C. bispinatus* (New Guinea); (57) *C. bispinatus* (Thailand); (58) *C. bispinatus* (Malaya); (59) *C. bispinatus* (Borneo). Surface sculpturing (other than ridges) is omitted.

I have compared the type-series of *Xiphidium (Xiphidion) brunneri* with the holotype and other material of *C. s. semivittatus* and consider them to be conspecific. The type-series of *brunneri* consists of 1 ♂, 1 ♀, of which I have selected the female as the lectotype as it is in a better state of preservation than the male.

Brachypterous specimens were more common than macropterous specimens by 37 to 26 and usually had rounded forewing apices. One brachypterous female from New Zealand had distinctly pointed forewings though, and the wings were slightly longer than those of the other brachypterous females. This feature has been described by Hudson (1972).

Three of the specimens examined were found to have one or two internoventral spines on one hind femur.

MATERIAL EXAMINED (63 specimens, brachypterous unless otherwise stated)

Decticus semivittatus Walker, holotype ♀, **New Zealand**: Auckland (*Sinclair*) (BMNH). *Xiphidium maoricum* Walker, lectotype ♀, macropterous, **New Zealand** (*Bolton*) (BMNH). *Xiphidium antipodum* Scudder, lectotype ♂, **New Zealand** (*Edwards*) (ANS, Philadelphia). *Xiphidium (Xiphidion) brunneri* Karny, lectotype ♀, **New Zealand** (*Hutton*) (NM, Vienna).

Australia: macropterous and brachypterous, New South Wales. **Kermadec Is.**: Raoul. **Lord Howe I.**: 1 ♂, 2 ♀, macropterous, 2 ♂, 2 ♀, NSW., ii–iii. **New Zealand**: 1 ♀, macropterous (*Bolton*) (BMNH) (paralectotype of *Xiphidium maoricum* Walker); 1 ♀, macropterous (*Colenso*) (BMNH) (*Xiphidium maoricum* Walker, var. B); 1 ♀ (*Edwards*) (ANS, Philadelphia) (paralectotype of *Xiphidium antipodum* Scudder); 1 ♂ (*Hutton*) (NM, Vienna) (paralectotype of *Xiphidium (Xiphidion) brunneri* Karny); macropterous and brachypterous, North I. (BMNH; BPBM, Honolulu.)

DISTRIBUTION (Table 1). This subspecies occurs in the south of the species range, extending northwards to Australia: New South Wales.

Conocephalus semivittatus vittatus (Redtenbacher) **nom. rev., stat. n.**
(Figs 8, 9, 50, 51, 53)

Xiphidium vittatum Redtenbacher, 1891:513. LECTOTYPE, ♂, ARU IS. (NM, Vienna), here designated [examined]. [Synonymized with *Conocephalus maoricus* (Walker) by Karny, 1912:11.]

Xiphidium geniculare Redtenbacher, 1891:527. LECTOTYPE, ♂, ARU IS. (NM, Vienna), here designated [examined]. [Synonymized with *Xiphidium semivittatum* (Walker) by Hutton, 1898:137.]

DIAGNOSIS. ♂ ♀. Dark stripe of dorsum of pronotum shaped as in Fig. 53. Forewings with or without spot on posterior margin (Fig. 28). Male cerci shaped as in Figs 8, 9. Female subgenital plate with excised or truncate apex. Ovipositor short. Song (of typical form) as in oscillograms (Figs 50, 51), consisting of a burst of sound usually lasting 5–6 seconds, occasionally up to 15 seconds. Each burst of sound consists of two alternating types of sound, the longer parts of which have a rate of *c.* 50 syllables per second, and the considerably shorter parts of which have a rate of 16–20 syllables per second. The songs of brachypterous and macropterous specimens were similar.

MEASUREMENTS

Typical form	Males	Females
Fastigium width	(47): 0·52– 0·76 (0·65)	(36): 0·52– 0·83 (0·68)
Median length of pronotum	(49): 2·8 – 3·9 (3·31)	(37): 3·0 – 4·0 (3·37)
Forewing length (macropterous)	(19): 18·0 –21·0 (19·35)	(14): 17·3 –21·3 (19·15)
(brachypterous)	(30): 4·0 – 7·5 (5·39)	(21): 2·1 – 4·3 (3·07)
Hind femur length	(39): 13·0 –16·4 (14·70)	(34): 14·2 –16·6 (15·46)
Ovipositor length		(37): 7·2 – 9·3 (8·69)
Small form	**Males**	**Females**
Fastigium width	(14): 0·57– 0·73 (0·66)	(24): 0·63– 0·81 (0·73)
Median length of pronotum	(14): 2·5 – 3·1 (2·89)	(24): 2·9 – 3·3 (3·11)
Forewing length (macropterous)	(2): 18·0 –18·1 (18·05)	(2): 19·1 –19·5 (19·30)
(brachypterous)	(12): 2·5 – 3·6 (3·25)	(19): 1·9 – 3·3 (2·39)
Hind femur length	(12): 11·7 –14·9 (13·22)	(24): 13·0 –15·1 (14·26)
Ovipositor length		(22): 7·3 – 8·3 (7·85)

DISCUSSION. *C. s. vittatus* differs from the nominate subspecies in the shape of the male cerci and the shorter ovipositor. The shape of the dorsal pronotal stripe of the typical form of *C. s. vittatus* also differs from the nominate subspecies; that of the small form is more variable and tends to be intermediate.

The specimens I am referring to as the small form show small but consistent differences from the rest of the subspecies. It is possible that they may prove to belong to a separate species, but this cannot be firmly established on the basis of present knowledge.

This form differs from the typical form of the subspecies, and also from *C. s. semivittatus*, in having no spot of pigmentation on the posterior forewing margin, or at most only a diffuse trace. It also differs from both in the shorter forewings of brachypterous males, the truncate apex of the female subgenital plate and the shape of the male cerci. The male cerci of the typical form of *C. s. vittatus* are more robust than in the others, while those of the small form are on average smaller than those of the other two, and to some extent intermediate in shape between the typical form and *C. tumidus*. The internal cercal spine of the small form is comparatively wider at the base than in the rest of the species.

The small form shares with *C. tumidus* most of the characters distinguishing it from the typical form, while sharing with the typical form the diagnostic features which separate *C. semivittatus* from *C. tumidus*.

Brachypterous specimens of *C. s. vittatus* were very much more common than macropterous, in the ratio of 7 to 1.

Redtenbacher (1891) gives *Xiphidium antipodum* and *X. bilineatum* as possible synonyms of *X. geniculare*. *X. antipodum* is in fact a synonym of *C. s. semivittatus*, and *C. bilineatus* is a valid species. *C. semivittatus* has been regarded as a synonym of *C. bilineatus* by several authors prior to Hudson, 1972, who rightly separated the two species, although she left *X. geniculare* as a synonym of *C. bilineatus*.

Xiphidium geniculare was synonymized with *Xiphidium semivittatum* by Hutton, 1898, but has since been placed as a synonym of *C. bilineatus*. I have examined 4 ♂ adults, 1 ♀ nymph from the type-series of *X. geniculare*, and I agree with the earlier synonymy. In addition to the syntypes examined, from which I have selected a male lectotype, there are specimens from Mioko, New Zealand and 1 ♂ from the Aru Is. which I have not seen. I have also selected a male lectotype from the type-series of *Xiphidium vittatum*, consisting of 1 ♂, 1 ♀ which I have examined, and one or more specimens from New Zealand which I have not seen.

One of the apical spurs was missing on one hind tibia in two specimens examined.

MATERIAL EXAMINED

Xiphidium vittatum Redtenbacher, lectotype ♂, macropterous, **Aru Is.** (*Ribbe*) (NM, Vienna). *Xiphidium geniculare* Redtenbacher, lectotype ♂, **Aru Is.** (*Ribbe*) (NM, Vienna).

Typical form (273 Pacific specimens, brachypterous unless otherwise stated). **Admiralty Is.**: 1 ♂, Manus, Lorengau, 1–75 m, vi; 1 ♀, M., near Lorengau, vi; 2 ♀, M., *c.* 8 km E. of Lorengau, near Lombrum, vi; 2 ♀, M., 6 km SE. of Lorengau, Rossum, 180 m, xii; 1 ♂, M., Rossum, 32–125 m, vi; 1 ♂, 1 ♀, M., Momote, xii. **Australia**: N. Queensland. **Duke of York Group**: 1 ♂, Mioko (between New Britain and New Ireland) (NM, Vienna) (paralectotype of *Xiphidium geniculare* Redtenbacher). **New Britain**: 2 ♂, Akanglo I., near Kandrian, S. coast, iv; 1 ♂, Baronga I., near Lindenhafen, iv; 2 ♂, Gazelle Peninsula, Baining, St Paul's, 350 m, ix; 2 ♂, G. P., Keravat, 60 m, viii; 1 ♂, G. P., 10 km E. of Keravat, Vunabakan, 180 m, xi; 1 ♂, G. P., Upper Warongoi, 250–600 m, xi; 1 ♂, 2 ♀, macropterous, G. P., Warongoi Valley, 100 m, v. **New Guinea**: macropterous and brachypterous, Irian Jaya; macropterous and brachypterous, Papua New Guinea, and associated tape recordings. **New Hebrides**: Banks Is.; Epi; Espiritu Santo; Malekula; Pentecost; Vanua Lava. **New Ireland**: 1 ♀, SW., Gilingil Pl'n, 2 m, vii. **Solomon Is.**: 1 ♀, Bellona, xi; 1 ♀, B., Henuangoto, x; 1 ♀, macropterous, Biawa, iv; 1 ♂, macropterous, 1 ♂, Bougainville, near Crown Prince Range, Kokure, 900 m, vi; 1 ♂, B., S., Kieta, xi; 1 ♂, B., Mumurai, vi; 2 ♀, B., Teopasino, *c.* 5° 40′ S, 155° 07′ E, vi; 1 ♀, Choiseul, Malangona, 10 m, iii; 1 ♂, Guadalcanal, xii; 1 ♂, G., Gold Ridge, iii; 1 ♂, G., Honiara District, Kukum, viii; 2 ♂, G., H. D., Poha R., vii–x; 1 ♂, macropterous, 2 ♂, 2 ♀, G., H. D., Tenaru, v–x; 1 ♂, G., Ruavatu, iv; 4 ♂, 1 ♀, G., Suta, 500–1200 m, vi; 1 ♀, G., Sutakiki R., iv; 2 ♀, G., Tapenanje, xii; 1 ♀, G., Tapenanje, *c.* 335 m, xii; 1 ♂, Malaita, Auki, 2–20 m, ix; 1 ♂, M., Fulisango-Maelegwasu, v; 1 ♂. Rendova, x; 2 ♂, 1 ♀, San Cristobal, Huni R. Mouth, viii; 1 ♂, S. C., Kira-Kira, grass, xi; 1 ♀, Santa Cruz Is., coconut, xi; 1 ♂, 1 ♀, Santa Isabel, Gatere, ii; 1 ♀, S. I., Maringe Lagoon (Lgu' ?), ii; 1 ♂, Western Group, Kolombangara, Kuli, x; 1 ♂, K., 2 km inland from Kuzi, by Kolombangara R., ix. (BMNH; DSIR, Auckland; ANIC, Canberra; BPBM, Honolulu; DPI, Konedobu.)

Extralimital material. **Aru Is.**: 2 ♂ (*Ribbe*) (NM, Vienna) (paralectotypes of *Xiphidium geniculare* Redtenbacher); 1 ♀, macropterous (*Ribbe*) (NM, Vienna) (paralectotype of *Xiphidium vittatum* Redtenbacher). **Kai Archipelago**: Taäm. **Moluccas. Philippines. Sulawesi**: Cape Dulang? ('Ke Dulan').

Small form (38 Pacific specimens). **New Guinea**: macropterous and brachypterous, Irian Jaya; macropterous and brachypterous, Papua New Guinea. (BMNH; ANIC, Canberra; BPBM, Honolulu.)

Extralimital material. **Philippines**: macropterous and brachypterous.

DISTRIBUTION (Table 1). This subspecies occurs in the north of the species range extending southwards to Australia: N. Queensland and the New Hebrides. The two forms of *C. s. vittatus* are sympatric, although the small form has a more restricted distribution.

***Conocephalus tumidus* sp. n.**

(Figs 10, 23, 29, 54)

DESCRIPTION AND DIAGNOSIS. ♂ ♀. Fastigium of vertex very wide, usually slightly more than width of basal antennal segment. Prosternum bispinose. Brachypterous. Forewings with dark pigmentation in costal and precostal areas, without spot at posterior margin (Fig. 29). Cross-veins of costal and precostal areas of forewings reduced, irregular. Stridulatory file of left male forewing shaped as in Figs 45 and 46. Hind femora usually with 1–4 externoventral spines; one femur sometimes unarmed. Hind tibiae usually with not more than 4 apical spurs (ventral pair missing). In some cases one, or occasionally both, internodorsal apical spurs also missing. Male cerci as in Fig. 10, swollen in middle, with one well-developed internal spine and one tubercle. Titillators as in Fig. 54. Female subgenital plate with truncate apex. Ovipositor short, relatively straight (Fig. 23).

General coloration: mixture of green, reddish brown and dark brown. Head and pronotum with dark brown, dorsal, longitudinal stripe, with light margins on the pronotum. Femora usually with small dark spots. Abdomen sometimes with wide, longitudinal stripes, faintly darker than ground colour.

MEASUREMENTS

	Males	Females
Total length	(5): 11·6 –13·9 (12·48)	(4): 12·8 –16·1 (14·40)
Fastigium width	(6): 0·62– 0·93 (0·72)	(4): 0·83– 0·91 (0·85)
Median length of pronotum	(6): 2·7 – 3·3 (2·97)	(4): 3·1 – 3·3 (3·19)
Forewing length	(6): 4·9 – 6·1 (5·30)	(4): 2·6 – 3·0 (2·89)
Hind femur length	(5): 10·5 –13·5 (11·85)	(3): 12·7 –14·2 (13·40)
Ovipositor length		(4): 7·4 – 8·4 (7·98)

DISCUSSION. *C. tumidus* is similar to *C. semivittatus*, particularly the small form of *C. s. vittatus*. The males can be distinguished by the shape of the cerci, and in most cases by the hind tibial apical spurs. The females can be distinguished by the hind tibial apical spurs together with the wide fastigium of the vertex. The ventral hind tibial apical spurs were absent in all except one of the specimens examined and were often replaced by hairs. The right forewing of the brachypterous males was usually slightly longer (by 0·3 mm on average) than the left forewing.

MATERIAL EXAMINED

Holotype ♂, **New Guinea**: Papua New Guinea, NE., 48 km E. of Kainantu, Kassam, 1350 m, 28.x.1959 (*Maa*) (BPBM, Honolulu).

Paratypes. **New Guinea**: 1 ♂, 1 ♀, Papua New Guinea, Eastern Highlands District, 25 km ENE. of Kainantu, Kassam Pass, 16.ii.1976 (*Farrow*) (ANIC, Canberra); 1 ♂, 1 ♀, P. N. G., Eastern Highlands District, 25 km ENE. of Kainantu, Kassam Pass, 16.ii.1976 (*Farrow*) (BMNH); 1 ♂, P. N. G., NE., 48 km E. of Kainantu, Kassam, 1350 m, 28.x.1959 (*Maa*) (BMNH); 1 ♂, P. N. G., NE., 48 km E. of Kainantu, Kassam, 1350 m, 30.x.1959 (*Maa*) (BPBM, Honolulu); 1 ♀, P. N. G., Morobe District, Ramu-Markham Valley, Gusap Downs Sta., 13.ii.1976 (*Farrow*) (ANIC, Canberra); 1 ♂, 1 ♀, P. N. G., Morobe District, Ramu-Markham Valley, Gusap Downs Sta., 14.ii.1976 (*Farrow*) (ANIC, Canberra).

DISTRIBUTION (Table 1). Known only from north-eastern New Guinea.

Conocephalus trivittatus (Stål)
(Fig. 11)

Xiphidium trivittatum Stål, 1860: 323. LECTOTYPE ♂, SOCIETY Is. (NR, Stockholm), here designated [examined].

DIAGNOSIS. ♂ ♀. Fastigium of vertex moderately wide. Prosternum bispinose. Brachypterous. Forewings with darker pigmentation, sometimes faint, towards the base of the costal and precostal areas. Cross-veins of costal and precostal areas of forewings regular, parallel. Stridulatory file of left male forewing shaped as in Figs 45 and 46. Hind femora unarmed ventrally. Hind tibiae with 6 apical spurs. Male cerci as in Fig. 11, with one well-developed internal spine and one tubercle. Ovipositor of medium length, relatively straight.

MEASUREMENTS

	Male	Female
Fastigium width	0·60	0·69
Median length of pronotum	2·8	3·1
Forewing length	5·2	4·6
Length of stridulatory area	1·04	
Hind femur length	10·5	11·3
Ovipositor length		10·7

DISCUSSION. This species resembles *C. semivittatus* in the form of the male cerci, and forewing pigmentation, and *C. oceanicus* and related species in the subcostal forewing venation and to a lesser extent, the male cerci. It can be distinguished from these species, however, by the unarmed hind femora. The tubercle of the male cerci is comparatively small.

The lectotype of *Xiphidium trivittatum* was selected from a syntypic series of 1 ♂, 1 ♀.

MATERIAL EXAMINED

Lectotype ♂, **Society Is.**: Tahiti (*Kinb.*) (NR, Stockholm).

Society Is.: 1 ♀, Tahiti (*Kinb.*) (NR, Stockholm) (paralectotype).

DISTRIBUTION (Table 1). Known only from the type-locality.

Conocephalus upoluensis (Karny) **nom. rev., stat. n.**

(Figs 12, 30, 41)

Xiphidium modestum Redtenbacher, 1891:510. LECTOTYPE ♂, AUSTRALIA (NM, Vienna), here designated [examined]. [Homonym of *Xiphidium modestum* Bruner, 1891:56.]

Xiphidium (Xiphidion) modestum upoluense Karny, 1907:95. LECTOTYPE ♂, SAMOA (NM, Vienna), here designated [examined]. [Synonymized with *Xiphidium modestum* Redtenbacher by Holdhaus, 1908:11.]

Conocephalus brevixiphus Willemse, 1942:95. Holotype ♀, AUSTRALIA (NM, Basle) [examined]. **Syn. n.**

DIAGNOSIS. ♂ ♀. Fastigium of vertex wide. Prosternum bispinose. Macropterous. Forewings with dark pigmentation in costal and precostal areas and comparatively small dark spots elsewhere; with or without dark line or spot towards base of posterior margin, usually faint if present (Fig. 30); light and dark pigmentation usually not strongly contrasted. Cross-veins of costal and precostal areas of forewings irregular. Stridulatory file of left male forewing shaped as in Figs 45 and 46. Hind femora unarmed ventrally. Hind tibiae usually with 4 apical spurs (ventral pair missing). Male tenth abdominal tergite nearly unmodified or slightly produced at apex but not bent downwards (Fig. 41). Male cerci moderately slender in apical part, with one internal spine and usually with one minute tubercle or slight swelling (Fig. 12). Ovipositor moderately short, relatively straight.

MEASUREMENTS

	Males	Females
Fastigium width	(21): 0·59– 0·86 (0·70)	(20): 0·59– 0·81 (0·74)
Median length of pronotum	(25): 2·6 – 3·8 (3·09)	(21): 2·7 – 3·7 (3·18)
Forewing length	(25): 13·3 –22·2 (17·13)	(22): 14·2 –23·0 (18·31)
Length of stridulatory area	(20): 1·55– 2·19 (1·84)	
Hind femur length	(20): 10·8 –15·1 (12·92)	(22): 11·8 –16·5 (14·26)
Ovipositor length		(22): 6·8 –11·0 (8·93)

DISCUSSION. *C. upoluensis* very closely resembles *C. albescens*, but may be distinguished from it by the shape of the male cerci and tenth abdominal tergite, and the fairly short ovipositor. The dark pigmentation of the forewings of *C. upoluensis* varies from being very faint to being as conspicuous as in *C. albescens,* although the latter species usually has more strongly contrasted light and dark pigmentation. Both species have one internal spine and a minute tubercle on the male cerci, thus being intermediate between species with one internal spine and species with one internal spine and a tubercle. This tubercle is sometimes virtually absent in *C. albescens*, and very occasionally absent in *C. upoluensis*.

The species was originally described as *Xiphidium modestum* by Redtenbacher in July, 1891. I have found this to be a primary homonym of a species described by Bruner in March, 1891, from U.S.A.

Comparison of the type-specimens and other material of *C. brevixiphus* and *C. upoluensis* has shown them to be conspecific. Willemse's description of *C. brevixiphus* refers to a female type, and I therefore regard this specimen as the holotype, despite the fact that it is labelled 'Allotype' and a male paratype is labelled 'Type'. I have selected a lectotype from the 1 ♂, 3 ♀ syntypes of *Xiphidium modestum upoluense*, all of which I have examined. I have also selected a lectotype from the syntype-series of *Xiphidium modestum*. In addition to the specimens listed under material examined, there are syntypes which I have not examined with the following data: Australia: Cape York (Brunner). Fiji: ——; Ovalau. Tonga Is.: Tongatapu. The syntypes with the following data are lost (see Weidner, 1966:243): Australia: Peak Downs; Sydney. Samoa. There are also 2 ♂ syntypes which are *C. albescens* and I have listed them under that species.

MATERIAL EXAMINED (175 Pacific specimens)
Xiphidium modestum Redtenbacher, lectotype ♂, **Australia**: Sydney (*Trauenfeld*) (NM, Vienna). *Xiphidium (Xiphidion) modestum upoluense* Karny, lectotype ♂, **Samoa**: Western, Upolu (*Rechinger*) (NM, Vienna). *Conocephalus brevixiphus* Willemse, holotype ♀, **Australia**: Northern Territory, Marrakai, v.1931 (*Handschin*) (NM, Basle) (mislabelled 'Allotype').

Australia: A. C. T.: New South Wales; Northern Territory; 1 ♂, 1 ♀, N. T., Burnside, v.1931 (*Handschin*) (NM, Basle) (paratypes of *C. brevixiphus* Willemse); 1 ♂, N. T., Katherine, v.1931 (*Handschin*) (NM, Basle) (paratype of *C. brevixiphus* Willemse, mislabelled 'Type'); Queensland; S. Australia; Western Australia. **Cook Is.**: 1 ♂, Niue, Kaimiti Forest, on the firebreak, xi; 1 ♀, N., Vaiea Farm, vii. **Fiji Is.**: 1 ♂ (*Thorey*) (NM, Vienna) (paralectotype of *Xiphidium modestum* Redtenbacher); Aiwa; Kandavu; Komo; Lomaloma; Mango; Matuku; Oneata; Ovalau; Vanua Levu; Vanua Mbalavu; Vanua Vatu; Viti Levu; Waya; Yasawa Group. **Loyalty Is.**: Ouvéa. **New Britain**: 1 ♀, Gazelle Peninsula, Baining, St Paul's, 350 m, ix; 1 ♂, G. P., Gaulim, 140 m, x; 2 ♂, G. P., Keravat, Lowl Agr. Exp. Sta., at light in oilpalm block, v; 1 ♀, Nakanai Mts, Gisiluve, 1050 m, vii. **New Caledonia**: 1 ♀ (*Deyrolle*) (NM, Vienna) (paralectotype of *Xiphidium modestum* Redtenbacher). **New Guinea:** Irian Jaya; Papua New Guinea; 1 ♂, P. N. G., Katow (MHN, Geneva) (paralectotype of *Xiphidium modestum* Redtenbacher). **New Hebrides**: Aneityum; Efate; Erromango; Espiritu Santo; Malekula; Pentecost. **New Ireland**: 1 ♀, Anir I., x. Norfolk I.: 1 ♂; 2 ♂, 2 ♀, ii–xii; 1 ♀, 76 m, flying over creek, wet weather, iv; 1 ♀, Emily Bay, ii; 1 ♂, Kingatan, ii. **Samoa**: American, Tutuila; Western, Alafua; W., Savaii; W., Upolu; 3 ♀, W., Upolu (*Rechinger*) (NM, Vienna) (paralectotypes of *Xiphidium (Xiphidion) modestum upoluense* Karny). **Solomon Is.**: 1 ♂, vii-viii; 1 ♂, Bougainville, N. end, vi; 1 ♀, B., Buin, vi; 1 ♂, 1 ♀, B., Buin (Kangu), 1–50 m, v; 4 ♀, B., Numa Numa, *c.* 5° 53′ S, 155° 15′ E, vi; 1 ♀, B., Tokinoitu, 20 m, vi; 1 ♀, Buka, Agric. Sta., xii; 11 ♂, 5 ♀, Guadalcanal, xi–xii; 1 ♂, G., Honiara, ii; 1 ♀, G., Honiara District, viii; 7 ♂, 3 ♀, G., H. D., Ilu, ii–v; 1 ♂, 1 ♀, G., H. D., Tenaru, ii–vii; 2 ♂, G., Kukum, xi–xii; 1 ♀, G., Lunga, viii; 1 ♂, G., R. Poha, 5 m, vii; 1 ♂, G., Savo I., xii; 1 ♂, Malaita, Auki, 2–20 m, ix; 6 ♂, 6 ♀, New Georgia Group, Gizo, 30 m, vii; 2 ♂, 2 ♀, Nggela, Tulagi, ii–iii; 1 ♂, Olu Malau Is. (Three Sisters Is.), iv; 1 ♂, 1 ♀, Ontong Java, Peku, 0–10 m, xii; 1 ♀, Russell Is., Lingatu, vi; 1 ♀, Small Malaita, near Maramasike Passage, xi. **Tonga Is.**: 1 ♂ (MHN, Geneva) (paralectotype of *Xiphidium modestum* Redtenbacher); Eua; Niuatoputapu; Tongatapu. (BMNH; DSIR, Auckland; ANIC, Canberra; BPBM, Honolulu; DPI, Konedobu.)

Extralimital material. **Cocos Keeling Is. Lesser Sunda Is.**

DISTRIBUTION (Table 1). This species occurs widely in the Pacific. I have found a record of the species from New Zealand to be a misidentification for *C. albescens*, from the measurements and other characters given.

Conocephalus albescens (Walker)
(Figs 13, 42)

Xiphidium albescens Walker, 1869:275. Holotype ♀, AUSTRALIA (BMNH) [examined].
Xiphidium latifrons Redtenbacher, 1891:526. LECTOTYPE ♀, AUSTRALIA (MHN, Geneva), here designated [examined]. **Syn. n.**
[*Conocephalus modestus* (Redtenbacher); Hudson, 1972:254. Misidentification.]

DIAGNOSIS. ♂ ♀. Fastigium of vertex wide. Prosternum bispinose. Macropterous or brachypterous. Forewings with dark pigmentation in costal and precostal areas, with or without comparatively small dark spots elsewhere (similar to Fig. 30); light and dark pigmentation strongly contrasted. Left forewing, and sometimes right, with small dark line or spot towards base of posterior margin. Cross-veins of costal and precostal areas of forewings irregular. Stridulatory file of left male forewing shaped as in Figs 45 and 46. Hind femora unarmed ventrally. Hind tibiae usually with 4 apical spurs (ventral pair missing). Male tenth abdominal tergite with apex produced perpendicularly downwards (Fig. 42). Male cerci very slender in apical part, with one internal spine and one minute tubercle or swelling which is sometimes absent (Fig. 13). Ovipositor long, relatively straight.

MEASUREMENTS

	Males			Females		
Fastigium width	(30):	0·65– 0·77	(0·71)	(28):	0·68– 0·95	(0·77)
Median length of pronotum	(31):	2·9 – 3·4	(3·12)	(27):	2·8 – 3·6	(3·23)
Forewing length (macropterous)	(27):	15·1 –18·5	(16·48)	(22):	15·7 –19·6	(17·44)
(brachypterous)	(4):	8·5 –11·0	(9·95)	(5):	8·0 – 9·7	(8·68)

	Males	Females
Length of stridulatory area (macropterous)	(26): 1·87– 2·14 (1·99)	
(brachypterous)	(4): 1·58– 1·85 (1·70)	
Hind femur length	(26): 11·6 –13·9 (12·54)	(27): 12·3 –17·0 (14·21)
Ovipositor length		(26): 11·8 –17·1 (13·95)

DISCUSSION. This species is very similar to *C. upoluensis,* differing, however, in the shape of the male cerci and tenth abdominal tergite, and the long ovipositor. Two of the syntypes of *Xiphidium modestum* (name replaced by *C. upoluensis* q. v.) are *C. albescens,* and *C. albescens* has been mistaken in the subsequent literature for *C. upoluensis.*

Of the specimens examined 84% were macropterous, including the holotype of *Xiphidium albescens*. The type-specimens of *Xiphidium latifrons* are brachypterous. I have synonymized these two names since their type-specimens are otherwise morphologically identical. I have selected a lectotype from the two female syntypes of *X. latifrons* I have examined. The rest of the syntype-series, consisting of at least one male from Australia: Sydney, is lost (see Weidner, 1966:243).

MATERIAL EXAMINED (macropterous unless otherwise stated)
Xiphidium albescens Walker, holotype ♀, **Australia**: South Australia (*Bakewell*) (BMNH). *Xiphidium latifrons* Redtenbacher, lectotype ♀, brachypterous, **Australia:** New South Wales, Clarence River (MHN, Geneva).

Australia: 1 ♂, New South Wales (*Thorey*) (NM, Vienna) (paralectotype of *Xiphidium modestum* Redtenbacher); 22 ♂, 30 ♀, N. S. W., Cabramatta, i–xii; 1 ♂, 2 ♀, N. S. W., Cabramatta, Georges R. Valley, i; 1 ♂, N. S. W., Blue, Wentworth Falls, iii; 1 ♂, brachypterous, N. S. W., Canley Vale, ii; 1 ♀, N. S. W., Casula, iii; 1 ♀, brachypterous, N. S. W., Clarence River (MHN, Geneva) (paralectotype of *Xiphidium latifrons* Redtenbacher); 1 ♂, brachypterous, N. S. W., Coonabarabran, i; 1 ♀, N. S. W., Deep Creek, Waitpinga, ii; 1 ♂, 1 ♀, brachypterous, N. S. W., Narrabri, iii; 2 ♀, brachypterous, N. S. W., near Sydney, Gundaman, National Park, iv; 1 ♂, N. S. W., Villawood, iii; 1 ♂, brachypterous, Queensland, near Brisbane, Mogill, ix (BPBM, Honolulu). **Lord Howe I.**: 1 ♂ (*Stevens*) (NM, Vienna) (paralectotype of *Xiphidium modestum* Redtenbacher). **New Zealand**: 1 ♀, brachypterous, Northland, 48 km W. of Whangarei, Tangowahine, iv (BPBM, Honolulu). (In BMNH unless otherwise stated.)

DISTRIBUTION (Table 1). Known only from east to south-eastern Australia, Lord Howe I. and New Zealand.

Conocephalus bilineatus (Erichson)
(Fig. 14)

Xiphidium bilineatum Erichson, 1842:249. Holotype ♂, AUSTRALIA (MNHU, Berlin) [examined].
Xiphidion immaculatum Karny, 1911:343. Holotype ♀, AUSTRALIA (NM, Vienna) [examined]. **Syn. n.**

DIAGNOSIS. ♂ ♀. Fastigium of vertex of medium width. Prosternum bispinose. Macropterous or brachypterous. Forewings with darker pigmentation in the costal and precostal areas as in Fig. 29. Cross-veins of costal and precostal areas of forewings fairly irregular. Hind femora unarmed ventrally. Hind tibiae with 4 apical spurs (ventral pair missing). Male cerci as in Fig. 14, with one internal spine. Ovipositor of medium length, relatively straight.

MEASUREMENTS

	Males	Females
Fastigium width	(3): 0·47– 0·57 (0·51)	(3): 0·52– 0·55 (0·53)
Median length of pronotum	(2): 2·8 – 3·0 (2·85)	(3): 2·8 – 3·3 (3·03)
Forewing length (macropterous)	(1): 15·0	(2): 14·5 –17·0 (15·75)
(brachypterous)	(2): 5·0 – 5·2 (5·10)	(1): 2·3
Length of stridulatory area (brachypterous)	(1): 1·7	
Hind femur length	(2): 10·5 –11·6 (11·05)	(3): 11·7 –12·7 (12·20)
Ovipositor length		(3): 10·5 –10·6 (10·57)

DISCUSSION. This species has features in common with *C. albescens* and *C. upoluensis,* but it is distinguished from them by the narrower fastigium of the vertex together with the forewing pigmentation, and by the shape of the male cerci. The forewing pigmentation is sometimes very faint. Macropterous and brachypterous specimens were equally represented in the small sample examined.

Comparison of the holotype and other material of *C. bilineatus* and *Xiphidion immaculatum* has shown them to be conspecific, differing only in that the former is brachypterous and the latter is macropterous.

Material examined (macropterous unless otherwise stated)
Xiphidium bilineatum Erichson, holotype ♂, brachypterous, **Australia**: Tasmania (*Schayer*) (MNHU, Berlin). *Xiphidion immaculatum* Karny, holotype ♀, **Australia**: Victoria, Dandenong Ranges (NM, Vienna).

Australia: 1 ♀, Capital Territory, Mt Gingera, Snowy Flat, 1520 m, i (BMNH); 1 ♂, brachypterous, New South Wales, Forest Reefs (BMNH); 1 ♀, brachypterous, Tasmania, Swansea (BMNH). **New Zealand**: 1 ♂, South I., Tasman Valley, Glentanner Station, 610 m, tussock grass and low plants on arid hillside, ii (BMNH).

Distribution (Table 1). This species is known only from south-eastern Australia and New Zealand.

Conocephalus maculatus (Le Guillou)
(Figs 15, 31)

Xiphidion maculatum Le Guillou, 1841: 294. Holotype or syntypes, Sulawesi: Makassar (lost). NEOTYPE ♂, West Malaysia (BMNH), here designated [examined].

Locusta (Xiphidium) lepida de Haan, 1842: 189. LECTOTYPE ♂, Java (RNH, Leiden), here designated [examined]. [Synonymized by Redtenbacher, 1891: 515.]

Xiphidium continuum Walker, 1869: 271. Holotype ♀, Sierra Leone (BMNH) [examined]. **Syn. n.**

Xiphidion neglectum Bruner, 1920: 123, Holotype ♂, Cameroun (ANS, Philadelphia) [examined]. **Syn. n.**

Diagnosis. ♂ ♀. Fastigium of vertex moderately wide. Prosternum bispinose. Macropterous. Forewings pigmented with comparatively large dark spots; no markings in costal and precostal areas (Fig. 31). Cross-veins of costal and precostal areas of forewings irregular to almost regular. Stridulatory file of left male forewing shaped as in Fig. 47. Hind femora unarmed ventrally. Tibiae marked with spot towards base, dark on mid tibiae, often faint on others. Hind tibiae with 6 apical spurs. Male cerci as in Fig. 15, with one internal spine. Ovipositor very short, relatively straight.

Measurements

	Males	Females
Fastigium width	(20): 0·51– 0·72 (0·59)	(21): 0·62– 0·72 (0·66)
Median length of pronotum	(20): 2·7 – 3·3 (2·97)	(22): 2·9 – 3·4 (3·13)
Forewing length	(20): 13·0 –19·0 (15·70)	(21): 14·9 –21·4 (17·64)
Length of stridulatory area	(23): 1·49– 1·92 (1·75)	
Hind femur length	(20): 11·2 –14·3 (12·84)	(20): 12·6 –15·8 (14·02)
Ovipositor length		(22): 6·6 – 8·2 (7·33)

Discussion. *C. maculatus* may be easily recognized by the distinctive pigmentation, particularly of the forewings.

I believe the type-specimen(s) of *Xiphidion maculatum* to be lost since they are not in the original depository (MNHN, Paris). Supposed type-specimens of this were sent to me by Dr Donskoff of the MNHN, Paris, but differed irreconcilably from the description. I have selected a male neotype from West Malaysia in preference to any specimens available from nearer the original type-locality in Sulawesi, since the West Malaysian specimen is in a better state of preservation.

The type-series of *Locusta (Xiphidium) lepida* consists of 1 ♂, 1 ♀, of which I have examined the male and selected it as the lectotype.

Redtenbacher (1891: 515) listed *Xiphidium continuum* as a possible synonym of *Xiphidium maculatum*. I have compared the holotype of *X. continuum* with the neotype and many other specimens of *C. maculatus* and confirm the synonymy, although the holotype of *X. continuum* has a narrower fastigium of the vertex (0·49 mm) than the specimens examined from the Pacific.

Comparison of the holotype of *Xiphidion neglectum* with the neotype of *C. maculatus* has shown them to be conspecific, confirming the unpublished opinion of my colleague Mr J. Huxley. *X. neglectum* has a slightly narrower fastigium (0·46 mm) than the Pacific material I have examined, and the pigmentation is rather pale but there are no differences warranting a separate specific identity.

Xiphidium sinense Walker (1871:35) was synonymized with *C. maculatus* by Hebard (1922*a*:243). I have examined the two male syntypes of the former, from Hong Kong and China, and found one (from Hong Kong) to be *C. maculatus* and the other (from China) to be a clearly different species. I am here designating the male from China as LECTOTYPE, so that *X. sinense* (**sp. rev.**) is no longer synonymous with *C. maculatus*.

MATERIAL EXAMINED

Xiphidion maculatum Le Guillou, neotype ♂, **West Malaysia**: Klang Gates, 25.ii.1934 (*Miller*) (BMNH). *Locusta (Xiphidium) lepida* de Haan, lectotype ♂, **Java** (RNH, Leiden). *Xiphidium continuum* Walker, holotype ♀, **Sierra Leone** ('pres. Morgan') (BMNH). *Xiphidion neglectum* Bruner, holotype ♂, **Cameroun**: Batanga, iv.1914 (*Hope*) (ANS, Philadelphia).

Australia: 1 ♂, Northern Territory, 7 km ESE. of Nhulunbuy, 12° 17′ S, 136° 50′ E, v; 1 ♂, 4 ♀, Queensland, Cairns; 1 ♂, Q., Cairns, Freshwater Creek, ii; 1 ♂, Q., Redlynch, ix. **New Guinea**: 2 ♂, 1 ♀, Irian Jaya, Kulima, 1400 m, ii; 1 ♂, 1 ♀, I. J., Swart Valley, W. side, 1400–2000 m, xi; 1 ♂, 2 ♀, I. J., W. of Swart Valley, Kutsime, 1500 m, xi; 1 ♂, 2 ♀, I. J., Wamena, 1700 m, ii; 1 ♀, Papua New Guinea, Aiyura, xii; 1 ♂, 1 ♀, P. N. G., Asaro V., Miramar, 1800 m, vi; 2 ♀, P. N. G., Bena R., 1500–1550 m, ix; 1 ♂, P. N. G., Bisianumu, viii; 1 ♀, P. N. G., Central District, 2 km NW. of Bomana War Cemetery, 9° 24′ S, 147° 14′ E, iv; 1 ♀, P. N. G., C. D., Brown River, Karema, 9° 12′ S, 147° 14′ E, viii; 1 ♂, P. N. G., C. D., Idlers Bay (picnic area), 9° 29′ S, 147° 05′ E, iv; 1 ♂, P. N. G., C. D., E. of Port Moresby, Otomata Plantation, 1 m, xi; 1 ♂, 2 ♀, P. N. G., C. D., Sogeri Plateau, 4 km SSE. of Iorowari, 9° 27′ S, 147° 26′ E, iv–vii; 1 ♂, 1 ♀, P. N. G., Chimbu District, Bomai, vi; 1 ♀, P. N. G., Finschhafen, iv; 1 ♀, P. N. G., Garaina, 830 m, i; 3 ♀, P. N. G., Goroka, 1550 m, v–vi; 2 ♀, P. N. G., 24 km E. of Kainantu, viii; 1 ♀, P. N. G., 30 km S. of Kainantu, Sinofi, 1590 m, x; 1 ♂, P. N. G., Lae, vii; 1 ♀, P. N. G., Maprik, x; 4 ♂, 3 ♀, P. N. G., Morobe District, Gusap Downs Sta., Ramu-Markham Valley, ii; 1 ♀, P. N. G., M. D., Wau, 1200 m, iv; 1 ♀, P. N. G., Musgrave R., near Javarere, Daradae, x; 1 ♂, 1 ♀, P. N. G., 9 km N. of Port Moresby, 9° 25′ S, 147° 08′ E, iv; 1 ♀, P. N. G., Port Moresby, Lawes Rd, at lights, iii; 1 ♀, P. N. G., Sepik District, Dreikikir, 350 m, vi; 1 ♂, P. N. G., Subitana-Musgrave District, iv; 5 ♂, 3 ♀, P. N. G., Swart Valley, Karubaka, 1450 m, xi; 1 ♂, P. N. G., Western District, Daru, 9° 05′ S, 143° 12′ E, v; 1 ♂, 1 ♀, P. N. G., W. D., Lake Murray (Patrol Post), iv; 1 ♂, P. N. G., W. D., Mabaduan, x; 1 ♀, P. N. G., W. D., 2–3 km S. of Morehead, 8° 44′ S, 141° 38′ E, viii; 1 ♂, P. N. G., W. D., 6 km N. of Morehead, 8° 39′ S, 141° 38′ E, ix; 1 ♀, P. N. G., W. D., R. Morehead, Rouku, iii–v; 1 ♂, P. N. G., W. D., Oriomo Govt Sta., x; 3 ♂, 1 ♀, P. N. G., W. Highlands, Mt Hagen Valley, Keltiga, 1710 m, ix–x. (BMNH; ANIC, Canberra; BPBM, Honolulu; DPI, Konedobu.)

Extralimital material. **Ethiopian Region. Malagasian Region. Hong Kong,** 1 ♂ ('pres. Bowring') (BMNH) (paralectotype of *Xiphidium sinense* Walker). **West Malaysia. Indonesia. Philippines.**

DISTRIBUTION (Table 1). This species is widely distributed throughout the tropical regions of the Old World, its range extending eastwards to Australia and New Guinea.

Conocephalus laetus (Redtenbacher)
(Figs 16, 39)

Xiphidium laetum Redtenbacher, 1891:514. Holotype ♀, AUSTRALIA (NM, Vienna) [examined].
Conocephalus dubius Willemse, 1942:95. Holotype ♂, AUSTRALIA (NM, Basle) [examined]. **Syn. n.**
Conocephalus raggei Harz, 1970:194. Holotype ♂, UGANDA (BMNH) [examined]. **Syn. n.**

DIAGNOSIS. ♂ ♀. Fastigium of vertex moderately narrow. Prosternum bispinose. Macropterous. Forewings unicolorous. Cross-veins of costal and precostal areas of forewings irregular. Stridulatory area of left male forewing large (Fig. 39). Stridulatory file of left male forewing shaped as in Fig. 47. Hind femora unarmed ventrally. Hind tibiae with 6 apical spurs. Male cerci as in Fig. 16, with one internal spine. Ovipositor long, straight.

MEASUREMENTS

	Males	Females
Fastigium width	(10): 0·42– 0·52 (0·46)	(12): 0·47– 0·52 (0·51)
Median length of pronotum	(11): 3·1 – 3·4 (3·26)	(14): 3·3 – 4·2 (3·68)
Forewing length	(11): 19·1 –22·2 (20·75)	(14): 21·7 –26·6 (24·03)
Length of stridulatory area	(10): 2·72– 3·20 (3·00)	
Hind femur length	(9): 12·6 –15·5 (13·94)	(12): 14·7 –18·5 (16·29)
Ovipositor length		(14): 13·7 –17·7 (15·30)

DISCUSSION. The large stridulatory area of the left male forewing and the long ovipositor distinguish *C. laetus* from the other species included in the present study with unicolorous forewings and unarmed hind femora.

The type-specimens of *C. dubius* and *C. raggei* were compared with the holotype and other material of *C. laetus*, and were found to be conspecific with them, despite the wide geographical separation. The holotype of *C. raggei* has a forewing length of 18·7 mm, slightly shorter than in any of the Pacific specimens examined, but shows no other morphological differences.

C. laetus closely resembles *C. gladiatus* (Redtenbacher), an oriental species which does not occur in the Pacific. I have found no consistent character for separating these two species. The main difference between them is in the ovipositor, which is considerably longer in *C. gladiatus*, and wing length, which is shorter in *C. gladiatus*. Many Oriental and Austro-oriental specimens which I have examined have both short wings (as in *C. gladiatus*) and a short ovipositor (as in *C. laetus*) or vice versa. The fastigium of the vertex of these specimens varies in width. In *C. laetus* the fastigium is moderately narrow, and it appears to be variable in *C. gladiatus*. I have omitted the specimens of doubtful identity from the list of material examined.

A minute, barely discernible, pointed swelling is sometimes present on the male cerci, at the base of the internal spine.

MATERIAL EXAMINED (25 Pacific specimens)
Xiphidium laetum Redtenbacher, holotype ♀, **Australia**: Queensland, Port Curtis ('Damel ded., coll. Br. v. W.') (NM, Vienna). *Conocephalus dubius* Willemse, holotype ♂, **Australia**: Northern Territory, Burnside, iv.1931 (*Handschin*) (NM, Basle). *Conocephalus raggei* Harz, holotype ♂, **Uganda**: Lake George, short grass plains, iii.1936 (*Johnston*) (BMNH).

Australia: 1 ♀, Northern Territory, Burnside, iv.1931 (*Handschin*) (NM, Basle) (allotype of *Conocephalus dubius* Willemse); Queensland (BMNH; BPBM, Honolulu). **New Guinea**: 1 ♂, 1 ♀, Irian Jaya, Sentani, 90+ m, vi (BMNH); 1 ♀, Papua New Guinea, Bulolu, 800–900 m, xi (BPBM, Honolulu); 1 ♂, P. N. G., Kokoda, 370 m, viii (BMNH); 2 ♂, 1 ♀, P. N. G., Morobe District, Gusap Downs Sta., Ramu-Markham Valley, ii (ANIC, Canberra); 1 ♂, P. N. G., Morobe District, Gusap Downs Sta., Ramu-Markham Valley, ii (BMNH); 1 ♂, P. N. G., Tapini, v (BPBM, Honolulu); 2 ♂, 1 ♀, P. N. G., Western District, Daru, 9° 05′ S, 143° 12′ E, viii (ANIC, Canberra); 1 ♀, P. N. G., W. D., Morehead, 8° 43′ S, 141° 38′ E, viii (ANIC, Canberra).

Extralimital material. **Celebes. N. Moluccas. Philippines. Central African Republic. Mali** (including 6 ♂, 1 ♀, paratypes of *C. raggei* Harz). **Nigeria** (including 1 ♀ paratype of *C. raggei* Harz). **Uganda** (including 4 ♂, 6 ♀ paratypes of *C. raggei* Harz). **Zaire** (1 ♂, 8 ♀ paratypes of *C. raggei* Harz).

DISTRIBUTION (Table 1). In the area of the present study, this species was previously known from Australia, and has been recorded from the New Hebrides although I have not seen specimens from there; it has now also been found in New Guinea. It occurs west of the Pacific in the Austro-Oriental Region, in tropical Africa, and possibly in the Oriental Region. This is a similar distribution pattern to that of *C. maculatus* which is, however, a much more common species.

Conocephalus angustivertex sp. n.

(Figs 17, 24, 32, 55)

DESCRIPTION AND DIAGNOSIS. ♂ ♀. Fastigium of vertex narrow, slightly less than half width of basal antennal segment. Prosternum bispinose. Macropterous or brachypterous. Forewings with broad band of dark pigmentation as in Fig. 32, and pigmentation in costal and precostal areas. Cross-veins of costal and precostal areas of forewings moderately irregular. Stridulatory file of left male forewing shaped as in Fig. 47. Hind femora with 1–8 externoventral spines, and frequently with 1–4 internoventral spines. Hind tibiae usually with 5 apical spurs (internodorsal spur missing or, exceptionally, present but small). Male tenth abdominal tergite with two comparatively large median projections at apex. Male cerci as in Fig. 17, with one internal spine. Titillators as in Fig. 55; weakly sclerotized. Female subgenital plate with excised apex. Ovipositor moderately short, gently curved (Fig. 24).

General coloration brown, with wide dark brown stripe along top of body from fastigium of vertex to end of abdomen. Abdomen, and usually pronotum, with lateral stripes, occasionally fusing with dorsal stripe; lateral stripes often slightly lighter than dorsal stripe although darker than ground colour. Lateral pronotum stripes narrower than dorsal stripe. Femora frequently with small dark brown or reddish spots.

MEASUREMENTS

	Males	Females
Total length (macropterous)	(4): 26·2 –29·5 (28·25)	(9): 28·3 –31·9 (29·71)
(brachypterous)	(6): 11·3 –15·0 (12·60)	(7): 13·5 –14·7 (14·01)
Fastigium width	(11): 0·27– 0·36 (0·31)	(16): 0·27– 0·38 (0·33)
Median length of pronotum	(11): 2·8 – 3·2 (2·95)	(16): 3·0 – 3·3 (3·10)
Forewing length (macropterous)	(4): 18·4 –21·2 (20·14)	(9): 20·0 –23·8 (21·21)
(brachypterous)	(7): 3·1 – 4·1 (3·69)	(7): 2·1 – 4·1 (2·48)
Hind femur length	(10): 12·5 –14·4 (13·39)	(14): 13·7 –14·7 (14·16)
Ovipositor length		(16): 7·9 – 9·2 (8·42)

DISCUSSION. *C. angustivertex* may be distinguished from all other species of the genus by the absence of the internodorsal hind tibial spurs, together with the shape of the male cerci and female ovipositor, and the forewing pigmentation. Macropterous and brachypterous specimens were nearly equally represented in the sample studied. The right forewing of the brachypterous males was usually slightly longer (by 0·4 mm on average) than the left forewing. The brachypterous specimens had rounded forewing apices with the exception of one female with sharply pointed forewings which were longer than those of the other brachypterous females. One shrivelled, possibly teneral, male specimen had colourless forewings.

MATERIAL EXAMINED

Holotype ♂, macropterous, **New Guinea**: Papua New Guinea, 24 km S. of Paup, Torricelli Mts, 520 m, 4–11.iii.1939 (*Moore*) (BMNH).

Paratypes. **New Guinea**: 1 ♀, macropterous, Irian Jaya, 40 km N. of Baliem Valley, Bokondini, *c.* 1300 m, 16–23.xi.1961 (*Quate*) (BPBM, Honolulu); 1 ♂, 1 ♀, brachypterous, I. J., Mt Cyclops, 1070 m, iii.1936 (*Cheesman*) (BMNH); 2 ♀, brachypterous, I. J., Cyclops Mts, Mt Lina, 1070 m, iii.1936 (*Cheesman*) (BMNH); 2 ♂, 4 ♀, brachypterous, I. J., Cyclops Mts, Mt Lina, 1070–1370 m, iii.1936 (*Cheesman*) (BMNH); 1 ♂, brachypterous, Papua New Guinea, Eastern Highlands District, 25 km ENE. of Kainantu, Kassam Pass, 16.ii.1976 (*Farrow*) (ANIC, Canberra); 1 ♂, brachypterous, P. N. G., NE., Swart Valley, Karubaka, 1450 m, 5.xi.1958 (*Gressitt*) (BPBM, Honolulu); 1 ♀, macropterous, P. N. G., NE., Upper Jimmi Valley, Tsenga, 14.vii.1955 (*Gressitt*) (BPBM, Honolulu); 1 ♂, brachypterous, P. N. G., NE., Upper Jimmi Valley, Tsenga, 1200 m, 15.vii.1955 (*Gressitt*) (BPBM, Honolulu); 1 ♂, macropterous, P. N. G., NE., Upper Jimmi Valley, Wana, 1500 m, 11.vii.1955 (*Gressitt*) (BPBM, Honolulu); 1 ♂, brachypterous, P. N. G., NE., Wana, Korop, 1500 m, 12.vii.1955 (*Gressitt*) (BPBM, Honolulu); 2 ♂, 6 ♀, macropterous, P. N. G., 24 km S. of Paup, Torricelli Mts, 520 m, 4–11.iii.1939 (*Moore*) (BMNH); 1 ♀, macropterous, P. N. G., Torricelli Mts, Afua, 15–30 m, 2.iv.1939 (*Moore*) (BMNH).

DISTRIBUTION (Table 1). Known only from New Guinea.

Conocephalus saltator (Saussure)

(Figs 18, 36, 38, 40, 44)

Xiphidium saltator Saussure, 1859: 208. Holotype ♀, GUYANA (MHN, Geneva) [examined].

Xiphidium meridionale Scudder, 1875: 460. Holotype ♀, BRAZIL (ANS, Philadelphia) [examined]. [Synonymized by Rehn & Hebard, 1915*b*: 269.]

Xiphidium propinquum Redtenbacher, 1891: 522. LECTOTYPE ♂, ST VINCENT (BMNH), here designated [examined]. [Synonymized by Rehn & Hebard, 1915*b*: 269.]

Xiphidium brachypterum Redtenbacher, 1891: 523. LECTOTYPE ♂, BRAZIL (NM, Vienna), here designated [examined]. [Synonymized by Rehn & Hebard, 1915*b*: 269.]

Xiphidium varipenne Swezey, 1905: 212. LECTOTYPE ♂, HAWAIIAN IS. (HSDA, Honolulu), here designated [examined]. [Synonymized by Hebard, 1922*b*: 347.]

DIAGNOSIS. ♂ ♀. Fastigium of vertex of medium width. Prosternum bispinose. Macropterous or brachypterous. Forewings unicolorous. Cross-veins of costal and precostal areas of forewings moderately regular and parallel. *MA* of forewings shaped as in Fig. 36. Stridulatory file of left male forewing shaped as in Fig. 47. Hind femora comparatively sharply swollen towards base (Fig. 38); with 1–6 externoventral spines, or occasionally unarmed. Hind tibiae with 6 apical spurs (Fig. 40). Male cerci shaped as in Fig. 18, with one internal spine. Female subgenital plate with truncate apex (Fig. 44). Ovipositor of medium length, relatively straight.

MEASUREMENTS

	Males	Females
Fastigium width	(31): 0·42– 0·63 (0·51)	(20): 0·44– 0·63 (0·56)
Median length of pronotum	(31): 2·7 – 3·4 (3·04)	(20): 3·1 – 3·9 (3·41)
Forewing length (macropterous)	(9): 13·9 –20·0 (18·06)	(4): 17·0 –20·1 (18·99)
(brachypterous)	(19): 4·5 – 8·2 (6·06)	(14): 3·5 –12·3 (5·28)
Length of stridulatory area (macropterous)	(11): 1·37– 1·47 (1·39)	
(brachypterous)	(18): 1·01– 1·27 (1·16)	
Hind femur length	(23): 10·7 –14·8 (12·89)	(18): 11·0 –15·4 (14·51)
Ovipositor length		(21): 10·7 –13·2 (11·79)

DISCUSSION. *C. saltator* differs from all the other species in the present study in the shape of the male cerci, with the internal spine positioned towards the base. The species is of Neotropical origin and has no close relatives in the Pacific. The females, however, are similar in appearance to those of *C. longipennis* and *C. oceanicus*. They may be distinguished particularly from the former by the truncate apex of the subgenital plate. Females of *C. saltator* also differ from *C. longipennis* in the fastigium width, and from *C. oceanicus* in the shape of the hind femora and the forewing venation.

The male cerci of *C. saltator* show some variation in length. The shape of the male cerci gives rise to a slight rounded swelling above the base of the internal spine. One specimen examined had only five apical spurs on one hind tibia due to the fusion of one ventral and one lateral spur.

I have selected a lectotype from the 2 ♂ syntypes of *Xiphidium propinquum* I have examined. There are additional syntypes from Guatemala (*Dohrn*) and Venezuela: Merida (*Brunner*), which I have not seen. I have also selected a male lectotype from the 2 ♂, 1 ♀ syntypes of *Xiphidium brachypterum* I have examined. The length of the stridulatory area of this specimen is 1·38 mm, longer than in the brachypterous Pacific specimens examined. There are other syntypes of this species which I have not examined: Brazil: 1 ♂; Colombia: 1 ♀; Venezuela: 1 ♀ (all NM, Vienna); Peru: 1 ♀ (MHN, Geneva).

I have selected a lectotype from 3 ♂, 1 ♀ specimens examined which I consider to be probable syntypes of *Xiphidium varipenne*. This was described from 'numerous specimens collected in Honolulu and elsewhere in the Hawaiian Islands'.

The holotype of *Xiphidium saltator* has an ovipositor length of 10·0 mm, shorter than in the Pacific specimens examined.

MATERIAL EXAMINED (52 Pacific specimens, brachypterous unless otherwise stated)
Xiphidium saltator Saussure, holotype ♀, macropterous, **Guyana** (MHN, Geneva). *Xiphidium meridionale* Scudder, holotype ♀, **Brazil** (*Janson*) (ANS, Philadelphia). *Xiphidium propinquum* Redtenbacher, lectotype ♂, **Windward Is.**: St Vincent, Windward side (*Smith*) (BMNH). *Xiphidium brachypterum* Redtenbacher, lectotype ♂, **Brazil**: Rio de Janeiro, Cachoeira (*Meyer-Düry*) (NM, Vienna). *Xiphidium varipenne* Swezey, lectotype ♂, **Hawaiian Is.**: Oahu, Mt Tantalus, 400 m, vii–x.1904 (*Giffard*) (HSDA, Honolulu).

Cook Is.: 1 ♂, macropterous, Mangaia, coast; 1 ♂, macropterous, M., Makatea; 1 ♀, macropterous, M., Makatea, coast; 1 ♂, Rarotonga, Ngatangiia, x; Temakatea. **Hawaiian Is.**: macropterous and brachypterous, Oahu; 2 ♂, 1 ♀, macropterous, O., Mt Tantalus, 400 m, vii–x.1904 (*Giffard*) (HSDA, Honolulu) (paralectotypes of *Xiphidium varipenne* Swezey). **Line Is.**: 2 ♂, 1 ♀, Palmyra, camp and airstrip area, 2–3 m, iii. **Samoa**: 1 ♂, American, Manua Is., Tau I., E. Tau Village (Luma), 50–200 m, ii; 1 ♀, A., Tutuila, viii; 1 ♂, A., T., near Alao, vi; 1 ♂, A., T., Aua-Afono Trail, ii; 1 ♀, A., T., Fagatoga Tr., reservoir, iii; 1 ♀, A., T., Pango Pango, north side, viii; 1 ♂, Western, Alafua, ii; 1 ♂, W., Savaii, Asau, i; 1 ♂, W., Upolu, ii; 1 ♀, macropterous, 1 ♂, 1 ♀, W., U., Apia, ii–vi; 1 ♂, 1 ♀, W., U., Sliding Rock, iv; 1 ♀, macropterous, 1 ♀, W., U., Utumapu, xii. (BMNH; DSIR, Auckland; ANIC, Canberra; BPBM, Honolulu.)

Extralimital material. Neotropical Region, macropterous and brachypterous; **Brazil**: 1 ♂ (NM, Vienna) (paralectotype of *Xiphidium brachypterum* Redtenbacher); **Peru**: 1 ♀ (MHN, Geneva) (paralectotype of *Xiphidium brachypterum* Redtenbacher); **Windward Is.**: 1 ♂, St Vincent (*Smith*) (BMNH) (paralectotype of *Xiphidium propinquum* Redtenbacher).

DISTRIBUTION (Table 1). This species was introduced from America to the Hawaiian Is., originally in the Honolulu area, *c.* 1890. It was first recorded from the Hawaiian Is. by Bruner in 1895 (Swezey, 1905: 212), whence it has spread gradually, now occurring also in the Line Is., Samoa and Cook Is.

Conocephalus longipennis (de Haan)
(Fig. 19)

Locusta (Xiphidium) longipennis de Haan, 1842: 189. LECTOTYPE ♂, SUMATRA (RNH, Leiden), here designated [examined].

Xiphidium spinipes Stål, 1877: 47. Lectotype ♀, PHILIPPINES (NR, Stockholm), designated by Sjöstedt (1933: 29) [examined]. [Synonymized by Hebard, 1922*a*: 245.]

Xiphidium longicorne Redtenbacher, 1891: 513. LECTOTYPE ♂, CAROLINE IS. (NM, Vienna), here designated [examined]. [Synonymized by Hebard, 1922*a*: 245.]

Conocephalus carolinensis Willemse, 1942: 98. Holotype ♀, CAROLINE IS. (BPBM, Honolulu) [examined]. **Syn. n.**

Conocephalus carolinensis f. *macroptera* Willemse, 1942: 99. Holotype ♀, CAROLINE IS. (BPBM, Honolulu) [examined]. **Syn. n.**

DIAGNOSIS. ♂ ♀. Fastigium of vertex narrow. Prosternum bispinose. Macropterous (occasionally brachypterous outside Pacific). Forewings unicolorous. Cross-veins of costal and precostal areas of forewings regular, parallel, varying to fairly irregular in some females. Stridulatory file of left male forewing shaped as in Fig. 47. Hind femora with 3–7 externoventral spines. Hind tibiae with 6 apical spurs. Male tenth abdominal tergite nearly unmodified, with apical projections very slight and broadly rounded. Male cerci shaped as in Fig. 19, with one internal spine with a globular apex. Female subgenital plate with excised apex. Ovipositor long, relatively straight.

MEASUREMENTS

	Males	Females
Fastigium width	(6): 0·30– 0·37 (0·32)	(4): 0·34– 0·42 (0·38)
Median length of pronotum	(6): 2·8 – 3·3 (3·03)	(4): 3·2 – 3·6 (3·31)
Forewing length	(6): 9·6 –18·2 (12·89)	(4): 13·3 –17·6 (14·58)
Hind femur length	(5): 12·1 –14·2 (12·91)	(3): 13·5 –14·5 (14·03)
Ovipositor length		(4): 12·6 –15·9 (14·10)

DISCUSSION. *C. longipennis* differs from all the other species included in the present study in the shape of the male cercus and the globular apex of its internal spine. The females can be distinguished from the other species with unicolorous forewings and hind femora with spines, by a combination of the following characters: the long, relatively straight ovipositor, the narrow fastigium, and the excised apex of the female subgenital plate.

All the Pacific specimens examined were macropterous, although some were only just so. They showed a considerable variation in wing length and *C. carolinensis* was originally described as two forms on the basis of this. Comparison of the type-series of *C. carolinensis* and *C. carolinensis* f. *macroptera* with the lectotype and other material of *C. longipennis* has shown them to be conspecific; *C. carolinensis* f. *macroptera* is merely a longer-winged variant. Willemse (1942) gives a photograph of what he refers to as the female 'type' of *C. carolinensis*. When I examined this specimen, which can be easily recognized from the photograph, I found it to be labelled as 'Allotype', while a male specimen in the type-series was labelled as 'Type'. I am nevertheless taking the photographed female specimen as being the holotype by Willemse's published designation.

One specimen of *C. longipennis* was found to have an internoventral spine on one hind femur, and one specimen lacked the internodorsal apical spur on one hind tibia.

I have selected a male lectotype of *Locusta (Xiphidium) longipennis* from 1 ♂, 1 ♀ syntypes I have examined. This lectotype has a forewing length of 20 mm, which is longer than in the Pacific specimens I have seen. One or more syntypes from Borneo: Bandjarmasin are missing.

I have also selected a male lectotype from the 3 ♂, 1 ♀ syntypes of *Xiphidium longicorne* I have examined. Other syntypes which I have not seen have the following data: Caroline Is.: ——; Yap (lost, see Weidner, 1966: 243); Yap (*Brunner*); Cook Is.: Rarotonga; East Indies.

The lectotype of *Xiphidium spinipes* exceeds the measurements of the Pacific specimens in the following: fastigium width 0·53 mm; median length of pronotum 3·8 mm; forewing length at least 21·8 mm (slightly damaged); hind femur length 17·6 mm and 17·9 mm; ovipositor length 16·8 mm.

MATERIAL EXAMINED

Locusta (Xiphidium) longipennis de Haan, lectotype ♂, **Sumatra**: Padang (RNH, Leiden). *Xiphidium spinipes* Stål, lectotype ♀, **Philippines** (*Semper*) (NR, Stockholm). *Xiphidium longicorne* Redtenbacher, lectotype ♂,

Caroline Is.: Palau Is. (*Semper*) (NM, Vienna). *Conocephalus carolinensis* Willemse, holotype ♀, **Caroline Is.**: Palau Is. Melokeiok, 6.iv.1936 (*Ono*) (BPBM, Honolulu) (mislabelled 'Allotype'). *Conocephalus carolinensis* f. *macroptera* Willemse, holotype ♀, **Caroline Is.**: Ponape, Wone, 11.ii.1936 (*Kondo*) (BPBM, Honolulu).

Caroline Is.: 1 ♀, Ponape, 6.iii.1936 (*Ono*) (NM, Maastricht) (paratype of *Conocephalus carolinensis* Willemse); 1 ♂, P., Roi, 14.ii.1936 (*Ono*) (BPBM, Honolulu) (allotype of *Conocephalus carolinensis* f. *macroptera* Willemse); 1 ♀, P., Ronkiti, 4.ii.1936 (*Ono*) (NM, Maastricht) (paratype of *Conocephalus carolinensis* Willemse); 1 ♂, Truk Is., Dublon, 25.xii.1935 (*Ono*) (NM, Maastricht) (paratype of *Conocephalus carolinensis* Willemse); 1 ♂, T., Moen, 27.xii.1935 (*Ono*) (NM, Maastricht) (paratype of *Conocephalus carolinensis* Willemse); 1 ♂, T., Tarik, 3.i.1936 (*Ono*) (BPBM, Honolulu) (paratype, mislabelled 'Type', of *Conocephalus carolinensis* Willemse). **Samoa**: 1 ♂, American, Tutuila, Fagatoga, i (BPBM, Honolulu).

Extralimital material. Oriental Region; **Borneo**: 1 ♂, 1 ♀ (*Boucard*) (NM, Vienna) (paralectotypes of *Xiphidium longicorne* Redtenbacher); **Java**: 1 ♂ (*Candèza*) (NM, Vienna) (paralectotype of *Xiphidium longicorne* Redtenbacher); **Philippines**: 1 ♀ (*Semper*) (NR, Stockholm) (paralectotype of *Xiphidium spinipes* Stål); **Sulawesi**; **Sumatra**: 1 ♀, Padang (RNH, Leiden) (paralectotype of *Locusta (Xiphidium) longipennis* de Haan); **West Malaysia**.

DISTRIBUTION (Table 1). This species is very restricted in the Pacific, specimens having been seen by me only from the Caroline Is. and Samoa. The species is, however, widespread in the Oriental and Austro-Oriental Regions.

Conocephalus willemsei nom. n.

(Figs 20, 26, 47)

Conocephalus ensiferus Willemse, 1942: 97. Holotype ♀, AUSTRALIA (NM, Basle) [examined]. [Homonym of *Conocephalus ensiferus* Bolívar, 1884: 88.]

DIAGNOSIS. ♂ ♀. Fastigium of vertex very narrow. Prosternum bispinose. Macropterous. Forewings unicolorous. Cross-veins of costal and precostal areas of forewings regular and parallel to rather irregular in some females. Stridulatory file of left male forewing shaped as in Fig. 47. Hind femora with 1–6 externoventral spines. Hind tibiae with 6 well-developed apical spurs. Male tenth abdominal tergite with two comparatively large median projections at apex. Male subgenital plate sometimes with small median notch at apex. Male cerci shaped as in Fig. 20, with one internal spine with pointed apex. Ovipositor moderately short to long, broad, shaped as in Fig. 26.

MEASUREMENTS

	Males	Females
Fastigium width	(5): 0·21– 0·36 (0·29)	(4): 0·24– 0·38 (0·32)
Median length of pronotum	(5): 3·0 – 3·3 (3·09)	(5): 3·2 – 4·1 (3·62)
Forewing length	(5): 20·8 –25·0 (21·95)	(5): 24·2 –30·0 (26·39)
Hind femur length	(5): 14·0 –16·4 (15·03)	(4): 14·8 –18·0 (16·51)
Ovipositor length		(5): 9·3 –15·1 (12·01)

DISCUSSION. *C. willemsei* differs from all the other species with unicolorous forewings in the present study in the shape of the male cerci, and the ovipositor. It is similar in some respects to *C. longipennis*, from which it differs additionally in forewing length, and it is the longest-winged *Conocephalus* species in the Pacific. The few specimens I have been able to examine show considerable variation in ovipositor length, both extremes being in Australia. The shape of the male cerci also varies from slender to stout. This species was originally described from a single female as *Conocephalus ensiferus* by Willemse in 1942. I have found this to be a primary homonym of a species described by Bolívar in 1884, from Peru.

MATERIAL EXAMINED

Holotype ♀, **Australia**: Northern Territory, Brock's Creek, 22.iv.1932 (NM, Basle).

Australia: 1 ♂, 2 ♀, Northern Territory, 22 km WSW. of Borroloola, 16° 08′ S, 136° 06′ E, iv; 1 ♂, N. T., 5 km NNW. of Cahills Crossing, East Alligator R., 12° 23′ S, 132° 57′ E, vi; 1 ♂, N. T., Humpty Doo, iii. **New Guinea**: 1 ♂, 2 ♀, Papua New Guinea, Western District, 1–3 km E. of Morehead, 8° 43′ S, 141° 39′ E, v; 1 ♂, P. N. G., W. D., 2–3 km S. of Morehead, 8° 44′ S, 141° 38′ E, iv. (BMNH; ANIC, Canberra).

DISTRIBUTION (Table 1). This species was previously known only from N. Australia, but has now also been found to occur in Papua New Guinea, in the south-western area near to Australia.

***Conocephalus bispinatus* sp. n.**
(Figs 21, 25, 56–59)

DESCRIPTION AND DIAGNOSIS. ♂ ♀. Fastigium of vertex very narrow, slightly less than half width of basal antennal segment. Prosternum unarmed. Macropterous. Forewings faintly smoked towards apex and around stridulatory area; otherwise unicolorous. Cross-veins of costal and precostal areas of forewings irregular, or sometimes moderately regular and parallel. Stridulatory file of left male forewing shaped as in Fig. 47. Tympanal region of fore tibiae tending to be bulbous. Mid femora usually with 1–4 externoventral spines. Hind femora with 3–8 externoventral spines, and 0–5 internoventral spines (0 in most Borneo specimens). Hind tibiae with 5–6 apical spurs (internodorsal spur missing, or present but very small). Male tenth abdominal tergite with 2 slight, broadly rounded, apical projections. Male subgenital plate with V-shaped incision. Female subgenital plate with approximately truncate apex. Male cerci as in Fig. 21, with 2 internal spines. Titillators as in Figs 56–59. Ovipositor very short, relatively straight (Fig. 25).

General coloration green, brown, or occasionally straw-coloured. Dorsum of head and pronotum of nearly all females examined with wide, dark stripe, with narrow, light, lateral borders; also with thin dark line at outer edge of light borders, on vertex. This pattern very faint or occasionally absent in males. Frons with large, black-patterned area in nearly all females, absent in males. Hind femora usually with dark brown or red 'herring-bone' pattern externally. Fore and mid femora usually with spots.

MEASUREMENTS
Type-series from New Guinea

	Male	Females
Total length	27·6	(5): 32·2 –35·7 (33·54)
Fastigium width	0·26	(6): 0·31– 0·36 (0·34)
Median length of pronotum	3·1	(6): 3·5 – 4·3 (3·68)
Forewing length	19·5	(6): 22·7 –28·2 (24·60)
Hind femur length	12·1	(6): 14·2 –17·7 (15·47)
Ovipositor length		(6): 6·7 – 8·5 (7·35)

Extralimital material (excluded from type-series)

	Males	Females
Total length	(5): 32·6 –37·0 (33·78)	(4): 35·8 –37·5 (36·78)
Fastigium width	(5): 0·28– 0·32 (0·31)	(4): 0·37– 0·40 (0·38)
Median length of pronotum	(5): 3·2 – 3·6 (3·42)	(4): 3·6 – 4·0 (3·75)
Forewing length	(5): 22·8 –25·2 (23·66)	(4): 25·2 –26·7 (25·88)
Hind femur length	(4): 13·4 –14·9 (13·91)	(4): 15·2 –16·0 (15·50)
Ovipositor length		(4): 6·8 – 7·9 (7·30)

DISCUSSION. *C. bispinatus* appears to be unique in the genus in almost always having ventral spines on the mid femora. It is one of the few species of the genus with an unarmed prosternum, and differs from all the other species of the genus with this feature by the following characters: bispinose male cerci, 5–6 hind tibial apical spurs, and at least in Pacific specimens of *C. bispinatus,* internoventral hind femoral spines. This last character is rarely found in *Conocephalus.*

The titillators of *C. bispinatus* were examined in the holotype, the single male available from New Guinea, and were found to be slender structures with a spinose apex, of a general form commonly found in *Conocephalus.* The titillators of specimens from Malaya and Thailand were larger and distinctly different in shape from those of the holotype, and those from Borneo were even larger and again strikingly different.

Other differences were evident between the specimens from New Guinea; Malaya, Thailand and Vietnam; and Borneo. Most specimens from Borneo lacked internoventral hind femoral spines while these were present in all the other specimens examined. The apex of the male cerci curved downwards in New Guinea specimens, slightly less so in Borneo specimens, and curved outwards slightly, not downwards, in specimens from Malaya and Thailand. The venation of the costal and precostal areas of the forewing was irregular in New Guinea specimens, although fairly regular in males and variable in females from outside the Pacific area. The tympanal region of the fore tibiae, already bulbous in females from New Guinea, was even more bulbous in both sexes outside the Pacific, particularly in specimens from Thailand and Vietnam. One specimen, from Thailand, lacked spines on one mid femur.

The specimens examined from outside the Pacific region have been excluded from the type-series because of these differences, particularly in the titillators. The specimens from New Guinea and the two groups of specimens from outside the Pacific may be geographical variants, or they may represent three distinct species, although closely related in many morphological characters. The information available, based on small samples of specimens and without song data, is insufficient to confirm the status of the specimens from outside the Pacific.

MATERIAL EXAMINED

Holotype ♂, **New Guinea**: Papua New Guinea, Western District, Morehead, 8° 43′ S, 141° 38′ E, 29.iv.1971 (*Balderson*) (ANIC, Canberra).

Paratypes. **New Guinea**: 1 ♀, Papua New Guinea, Morobe District, Wau, 1200 m, 15.v.1962 (*Sedlacek*) (BMNH); 1 ♀, P. N. G., Morobe District, Wau, 1700–1800 m, 17.xi.1961 (*Sedlacek*) (BPBM, Honolulu); 2 ♀, P. N. G., Port Moresby, Mt Lawes, 400 m, 5.iii–12.v.1963 (*Brandt*) (ANIC, Canberra); 1 ♀, P. N. G., Port Moresby, Mt Lawes, 400 m, iv.1963 (*Brandt*) (BMNH); 1 ♀, P. N. G. Western District, Morehead, 8° 43′ S, 141° 38′ E, 28.iv.1971 (*Balderson & Baker*) (ANIC, Canberra).

Material excluded from the type-series. **Borneo**: 2 ♂, Sabah, 11 km SSE. of Telupid, R. Karamuak, 60 m, 1–7.ix.1977 (*Bacchus*) (BMNH); 1 ♀, Sabah, 13 km S. of Telupid, Tawai Plateau, 400 m, 8.ix.1977 (*Bacchus*) (BMNH); 1 ♀, Sarawak, Gunong Mulu National Park, ii–vii.1978 (*Collins* (R.G.S. Exped. 1977–8)) (BMNH); 1 ♀, Sarawak, Gunong Mulu National Park, Long Pala (base), 70 m, alluvial, secondary forest, MV light trap, on batu, canopy, iii.1978 (*Holloway et al.* (R.G.S. Exped. 1977–8)) (BMNH); 1 ♂, Sarawak, Gunong Mulu National Park, 150 m, helipad, mixed dipterocarp forest, mainly canopy, MV light trap, ii.1978 (*Holloway et al.* (R.G.S. Exped. 1977–8)) (BMNH). **Thailand**: 1 ♂, in black light trap, vi.1963 (BMNH). **Vietnam**: 1 ♀, DiLinh, 27.ix–14.x.1960 (*Yoshimoto*) (BPBM, Honolulu). **West Malaysia**: 1 ♂, Kuala Lumpur, 24–31.xii.1958 (*Quata*) (BPBM, Honolulu).

DISTRIBUTION. This species, known in the Pacific only from Papua New Guinea, extends westwards to Thailand.

Conocephalus tridens Hebard
(Figs 22, 27)

Conocephalus tridens Hebard, 1933: 127. Holotype ♂, MARQUESAS IS. (BPBM, Honolulu) [examined].

DIAGNOSIS. ♂ ♀. Fastigium of vertex narrow. Prosternum unarmed. Macropterous. Forewings often with narrow band of rather faint pigmentation just below *R*, together with spots above this vein; sometimes unicolorous. Cross-veins of costal and precostal areas of forewings regular, parallel. Stridulatory file of left male forewing intermediate in shape between those shown in Figs 45, 46, and 47. Hind femora unarmed ventrally. Hind tibiae with 6 apical spurs. Male tenth abdominal tergite widely truncate at apex. Male cerci as in Fig. 22, with 3 internal spines. Ovipositor short and curved as in Fig. 27.

MEASUREMENTS

	Males	Females
Fastigium width	(7): 0·21– 0·37 (0·28)	(7): 0·21– 0·40 (0·32)
Median length of pronotum	(8): 3·4 – 4·1 (3·76)	(7): 3·6 – 4·2 (3·91)
Forewing length	(8): 14·4 –18·7 (16·54)	(7): 15·1 –21·0 (17·66)
Hind femur length	(8): 11·5 –14·3 (12·55)	(7): 12·2 –14·6 (13·06)
Ovipositor length		(6): 7·3 – 8·4 (7·77)

DISCUSSION. This species has several distinctive characters which separate it from all the other Pacific species of *Conocephalus*, including the form of the male cerci and the strongly curved ovipositor. Only one of these species, *C. bispinatus*, shares with *C. tridens* the unarmed prosternum.

MATERIAL EXAMINED

Holotype ♂, **Marquesas Is.**: Eiao, Vaituha, 370 m, on *Cassia occidentalis*, 3.x.1929 (*Adamson*) (BPBM, Honolulu).

Marquesas Is.: 2 ♂, Eiao, above Vaituha, 240 m, 29.ix.1929 (*Adamson*) (ANS, Philadelphia) (paratypes); 1 ♂, 1 ♀, E., above Vaituha, 340 m, on *Dodonaea viscosa*, 2.x.1929 (*Adamson*) (ANS, Philadelphia) (paratypes); 1 ♀, E., 520 m, 16.iv.1931 (*Le Bronnec & Tauraa*) (ANS, Philadelphia) (paratype); 1 ♀, E., 520 m, iv (ANS, Philadelphia); 1 ♂, E., *c.* 550 m, on *Sida* sp., 22.iv.1931 (*Le Bronnec & Tauraa*) (ANS, Philadelphia) (paratype); 1 ♂ nymph, E., 550 m, iv (ANS, Philadelphia); 1 ♀, E., near centre, 400 m, 1.x.1929 (*Adamson*) (ANS, Philadelphia) (paratype); 1 ♂, Fatu Hiva, i (BMNH); 1 ♂, Hiva Oa, i (BMNH); 1 ♀, H., Kaava Ridge, Kakahopuanui, 610 m, x (ANS, Philadelphia); 1 ♂, Tahuata, Amatea, 790 m, 27.vi.1930 (*Le Bronnec & Tauraa*) (ANS, Philadelphia) (paratype); 1 ♀, T., Amatea, 820 m, 7.vii.1930 (*Le Bronnec & Tauraa*) (ANS, Philadelphia) (paratype); 1 ♀ nymph, T., Vaitupaahei, 700 m, vii (ANS, Philadelphia).

DISTRIBUTION (Table 1). This species is endemic in the Marquesas Is.

References

Balgooy, M. M. J. van 1971. Plant-geography of the Pacific as based on a census of Phanerogam genera. *Blumea*, Suppl. 6: 222 pp.

Bolívar, I. 1884. *Artrópodos del viaje al Pacífico verificado de 1862 á 1865 por una comision de naturalistas enviada por el gobierno Español.* Insectos Neurópteros y Ortópteros. 114 pp. Madrid.

—— 1905. Conocéphalides de la Nouvelle-Guinée appartenant au Musée de Budapest. *Annls hist.-nat. Mus. natn. hung.* **3**: 388–395.

Bruner, L. 1891. Ten new species of Orthoptera from Nebraska – notes on habits, wing venation etc. *Can. Ent.* **23**: 36–40, 56–59, 70–73.

Burmeister, H. [1838]. 10. Geradflügler. Orthoptera. *Handb. Ent.* **2**: 459–743.

Erichson, W. F. 1842. Beitrag zur Insekten-Fauna von Vandiemensland, mit besonderer Berücksichtigung der geographischen Verbreitung der Insekten. *Arch. Naturgesch.* **8**: 83–287.

Gressitt, J. L. 1961. Problems in the zoogeography of Pacific and Antarctic insects. *Pacif. Insects Monogr.* **2**: 1–94.

Grist, D. H. & Lever, R. J. A. W. 1969. *Pests of rice.* 520 pp. London.

Haan, W. de 1842. Bijdragen tot de Kennis der Orthoptera. *In* Temminck, C. J., *Verh. Natuurl. Gesch. Ned. Overszee. Bezitt.* **2**: 45–248.

Harz, K. 1969. Vorläufige Revision der Gattung *Conocephalus* im Bereich der Paläarktis. *Ber. naturw. Ges. Bayreuth* **13**: 97–118.

—— 1970. New and little known Tettigoniidae (Orthoptera) from Israel and Africa. *Israel J. Zool.* **19**: 191–201.

Hebard, M. 1922*a*. Studies in Malayan, Melanesian and Australian Tettigoniidae (Orthoptera). *Proc. Acad. nat. Sci. Philad.* **74**: 121–299.

—— 1922*b*. The Dermaptera and Orthoptera of Hawaii. *Occ. Pap. Bernice P. Bishop Mus.* **7**: 303–379.

—— 1933. The Dermaptera and Orthoptera of the Marquesas Islands. *Bull. Bernice P. Bishop Mus.* **114**: 105–140.

Hennig, W. 1966. The Diptera fauna of New Zealand as a problem in systematics and zoogeography. *Pacif. Insects Monogr.* **9**: 1–81 [Translation from German by Wygodzinsky, P.]

Holdhaus, K. 1909. II. Teil. VII. Kritisches Verzeichnis der bisher von den Samoainseln bekannten Orthopteren. pp. 537–562. *In* Rechinger, K., Botanische und zoologische Ergebnisse einer wissenschaftlichen Forschungsreise nach den Samoainseln dem Neuguinea-Archipel und den Salomoninseln von März bis Dezember 1905. *Denkschr. Akad. Wiss., Wien* **84**: 385–562. [Published separately as a preprint in 1908.]

Hudson, L. 1972. New Zealand Tettigoniidae (Orthoptera). *Jl R. Soc. N.Z.* **2**: 249–255.

Hutton, F. W. 1898. Art. XVII. The grasshoppers and locusts of New Zealand and the Kermadec Islands. *Trans. Proc. N.Z. Inst.* **30**: 135–150.

Illingworth, J. F. 1929. Grasshoppers eat Pineapple Mealy Bugs and other pests. *Proc. Hawaii. ent. Soc.* **7**: 256–257.

Kalshoven, L. G. E. & Vecht, J. van der 1950. *De plagen van de cultuurgewassen in Indonesië.* **1**: 512 pp. Bandoeng.

Kaltenbach, A. 1968. Ergebnisse der österreichischen Neukaledonien-Expedition 1965. Neue und wenig bekannte Orthopteren aus Neukaledonien. 1. Mantodea, Saltatoria (exclus. Gryllodea) und Dermaptera. *Annln naturh. Mus. Wien* **72**: 539–556.

Karny, H. 1907. Revisio Conocephalidarum. *Abh. zool.-bot. Ges. Wien* **4**: 114 pp.

—— 1911. Descriptiones Conocephalidarum novarum. *Verh. zool.-bot. Ges. Wien* **61**: 334–347.

—— 1912. Orthoptera. Fam. Locustidae. Subfam. Conocephalinae. *In* Wystman, P. A. G., *Genera Insect.* **135**: 1–17.

—— 1926. Beiträge zur Malayischen Orthopterenfauna. *Treubia* **9**: 11–292.

Kirby, W. F. 1906. *A synonymic catalogue of Orthoptera* **2**(1): viii + 562 pp. London.

Latreille, P. A. 1827. *Natürliche Familien des Thierreichs. Aus dem Französichen. Mit Anmerkungen und Zusätzen.* *x* + 604 pp. Weimar. [German translation by Berthold, A. A. of Latreille, P. A. 1825. *Familles naturelles du règne animal.* 570 pp. Paris.]

Lee, K. E. 1975. Conclusions. pp. 477–486. *In* Corner, E. J. H. & Lee, K. E., A discussion on the results of the 1971 Royal Society–Percy Sladen Expedition to the New Hebrides. *Phil. Trans. R. Soc.* (B) **272**: 267–486.

Le Guillou, E. J. F. 1841. [Orthoptères nouv.] *Revue zool.* **4**: 291–295.

Marshall, B. C. 1964. Insect predation by *Conocephalus fasciatus* (Orthoptera, Tettigoniidae). *Ent. News* **75**: 204–205.

Ragge, D. R. 1955. *The wing-venation of the Orthoptera Saltatoria with notes on Dictyopteran wing-venation.* vi + 159 pp. London.

—— 1969. A revision of the African species of *Pseudorhynchus* Serville (Orthoptera: Tettigoniidae). *Bull. Br. Mus. nat. Hist.* (Ent.) **23**: 167–190.

Redtenbacher, J. 1891. Monographie der Conocephaliden. *Verh. zool.-bot. Ges. Wien* **41**: 315–562.

Rehn, J. A. G. & Hebard, M. 1915*a*. Studies in American Tettigoniidae (Orthoptera) V. *Trans. Am. ent. Soc.* **41**: 155–224.

—— & —— 1915*b*. Studies in American Tettigoniidae (Orthoptera) VI. *Trans. Am. ent. Soc.* **41**: 225–290.

Ross, H. H. 1956. *Evolution and classification of the mountain caddisflies.* vi + 213 pp. Urbana, Illinois.

Rothschild, G. H. L. 1970. Observations on the ecology of the rice-ear bug *Leptocorisa oratorius* (F.) (Hemiptera: Alydidae) in Sarawak (Malaysian Borneo). *J. appl. Ecol.* **7**: 147–167.

Sands, D. P. A. 1977. The biology and ecology of *Leptocorisa* (Hemiptera: Alydidae) in Papua New Guinea. *Res. Bull. Dep. prim. Ind.* no. 18: 104 pp.

Saussure, H. de 1859. Orthoptera nova Americana (Diagnoses praeliminares). *Revue Mag. Zool.* (2) **11**: 201–212.

Scudder, S. H. 1875. A century of Orthoptera. Decade II. – Locustariae. *Proc. Boston Soc. nat. Hist.* **17**: 454–462.

Serville, J. G. A. 1831. Revue méthodique des insectes de l'ordre des Orthoptères. Deuxième section. Sauteurs, Saltatoria. *Annls Sci. nat.* **22**: 134–167.

Sjöstedt, Y. 1933. Orthopterentypen im Naturhistorischen Reichsmuseum zu Stockholm. 4. Tettigoniidae. *Ark. Zool.* **25**: 1–30.

Stål, C. 1860. Orthoptera species novas descripsit. pp. 299–350. *In*: *Konglica Svenska Fregatten Eugenies Resa.* II. Zoologi. I. Insecta. 614 pp. Stockholm & Uppsala.

—— 1877. Orthoptera nova ex Insulis Philippinis descripsit. *Öfvers. K. VetenskAkad. Förh.* **34** (10): 33–58

Swezey, O. H. 1905. Leaf-hoppers and their natural enemies. (Pt. VII, Orthoptera, Coleoptera, Hemiptera). *Bull. Hawaiian Sug. Plrs' Ass. Exp. Stn* (Ent.) **1**: 207–238.

Thorne, R. F. 1963. Biotic distribution patterns in the tropical Pacific. pp. 311–350. *In* Gressitt, J. L. (ed.), *Pacific basin biogeography.* A symposium. ix + 563 pp. Honolulu.

Thunberg, C. P. 1815. Hemipterorum maxillosorum genera illustrata plurimisque novis speciebus ditata ac descripta. *Mém. Acad. Sci. St. Petersb.* **5**: 211–301.

Walker, F. 1869. *Catalogue of the specimens of Dermaptera Saltatoria in the collection of the British Museum.* **2**, pp. 225–423. London.

—— 1871. *Supplement to the catalogue of Dermaptera Saltatoria.* 95 pp. London.

Weidner, H. 1966. Die entomologischen Sammlungen des Zoologischen Staatsinstituts und Zoologischen Museums Hamburg. VI. Teil, Insecta III. *Mitt. hamb. zool. Mus. Inst.* **63**: 209–264.

Willemse, C. 1942. On a collection of Indo-Australian, Melanesian and Micronesian Tettigoniidae. *Natuurh. Maandbl.* **31**: 86–100, 107–112.

Yunus, A. 1967. Insect pests of rice in Malaysia. Part I. Malayan region. pp. 617–633. *In: The major insect pests of the rice plant.* Proceedings of a symposium at the International Rice Research Institute 1964. 729 pp. Baltimore.

Zimmerman, E. C. 1948. Subclass Pterygota (Brauer) Lang, 1889, Order Orthoptera Olivier, 1789. *Insects Hawaii* **2**: 73–158.

Index

Principal references are in **bold**; invalid names are in *italics*. References to the Checklist (p. 323) are not included.

affine 329
albescens 317, 321, 325, 341, **342,** 343
Aleurocybotus 317
angustivertex 317, 321, 325, 326, **346**
Anisoptera **321**
annulicornis 316
antipodum 336, 339
bilineatus 321, 325, 339, **343**
bispinatus 317, 321, 323, **351,** 352
bituberculatus 321
brachypterum 347
brevipes 316
brevixiphus 341
brunneri 336

carolinensis 349
Chloroxiphidion **321**
cinereus 317
Conocephalus **320, 321**
conocephalus 315, 320
consul 316
continuum 344

Decadarchis 316
dorsalis 321
dubius 345
Dymisococcus 316

ensiferus 350
Ereunetis 316

fasciata 321
fasciatus 317
Fatuhivella 321
flavistriata 316
fusca 321

geniculare 338
gladiatus 346

immaculatum 343
indicus 317
infumatus 319, 321, 326, 327, 329, 331, 332, **333**

javanicum 321

laetus 321, 323, **345**
latifrons 342
lepida 344
Leptocorisa 316, 317
longicorne 349
longipennis 317, 321, 326, 327, 329, 348, **349,** 350

macroptera 349
maculatus 321, 325, **344,** 346
maoricum 336, 338
melaenus 316
meridionale 347
modestum 341, 343
modestus 342

neglectum 344
Neoxiphidion 321
Nezara 316
Nukuhivella 321

oceanicus 317, 319, 321, 326, 327, **329,** 331, 332, 333, 335, 340, 348
oratorius 316, 317

Perkinsiella 316
propinquum 347
Pseudococcus 316

raggei 345
redtenbacheri 316, 319, 321, 326, 327, 329, **331,** 333, 335
Riptortus 316

saccharicida 316
saltator 316, 317, 319, 321, 325, 326, 327, **347**
semivittatus 321, 326, **335, 336,** 338, 339, 340
sinense 345
spinipes 349
starmuehlneri 319, 321, 326, 327, 329, **330,** 332, 333
strictum 321

Thecoxiphidion 321
tridens 317, 321, 323, **352**
trivittatus 319, 325, **340**
tumidus 319, 325, 326, 335, 338, **339**

upoluensis 317, 319, 321, 325, **341,** 343

varipenne 316, 347
viridula 316
vittatus 316, 319, 335, 336, **338,** 340

willemsei 326, **350**

Xiphidion 321
Xiphidium 321

British Museum (Natural History) Publications

Serial publications in the British Museum (Natural History) Library

3rd edition, 1980, 1436 pp, hard bound 297 mm × 210 mm, 3 volumes
£50.00 the set
(Available in North America from University of Virginia Press)

The catalogues of BM (NH) Bulletins and BM (NH) Books are available free on request.

Publications Sales
British Museum (Natural History)
Cromwell Road
London SW7 5BD

Standing orders placed by educational institutions earn a discount of 10% off our published price.

Titles to be published in Volume 41

A revision of the western Palaearctic species of the genus *Meteorus* (Hymenoptera: Braconidae). By T. Huddleston.

A revision of the Old World Polymorphanisini (Trichoptera: Hydropsychidae). By P. C. Barnard.

A review of the genera of Neotropical Encyrtidae (Hymenoptera: Chalcidoidea). By John S. Noyes.

A revision of the British species of *Dendrocerus* Ratzeburg (Hymenoptera: Ceraphronoidea) with a review of their biology as aphid hyperparasites. By N. D. M. Fergusson.

A revision of the Pacific species of *Conocephalus* Thunberg (Orthoptera: Tettigoniidae). By Linda M. Pitkin.

Printed by The Whitefriars Press Ltd, London and Tonbridge